Telephony.

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LOCAL COMPANIES IMPORTANT PART IN TELEPHONE DEVELOPMENT

Three weeks hence Independent telephone men will gather in Chicago for their annual national convention. This year the meeting is attended by certain circumstances that make it especially significant and should attract the attention of the industry to an unusual degree.

The year 1926 marks the 50th birthday of the telephone, and the October convention is the 30th annual gathering of the Independents, according to the calendar records of the United States Independent Telephone Association.

While observing the semi-centennial of the telephone next month, the Independent group with propriety can lay emphasis on the important part its members have played during the last three decades in the development of the industry. While present-day problems demand planning ahead for successful growth in the future, it requires only a glance back over these 30 years to remind the student of telephone history that the Independents, with their local service companies, have had a great deal to do with the job of making the United States the leading telephone country of the world.

* * * *

It was the courage, hard work and money that the Independents put into their local companies that enabled thousands of American communities to have telephone service at an early day when the Bell interests were having their own troubles concentrating on establishing exchanges in the larger cities.

In this day and age, when big business combinations occupy the center of the stage—not always with public approval—the achievements of the smaller, individual units should not be forgotten. They are doing their part in serving the public all over the country, and, so far as the telephone business is concerned, they are doing it well. The valuable work that Independent telephony has done in the development of America cannot be over-estimated.

* * * *

Frequent references have been made in these columns to the success which locally-owned telephone companies have experienced in extending telephone service in the smaller towns and rural districts of the country. Furthermore, that the rapid development of the telephone in such communities has been due principally to the enterprise and pioneering work of Independent telephone men who strove to give the people telephone service in the face of the difficulties that usually mark the efforts of those who blaze the way in any new undertaking.

It is interesting to note that similar conditions have characterized the history of telephone growth in Canada.

Francis Dagger, supervisor of telephone systems for the Province of Ontario, who has been prominently identified with telephone development in the Dominion for more than 20 years, recommended as far back as 1908 that the rural telephone development be left to private local initiative, notwithstanding the fact that the government had decided on a policy of public ownership of telephones.

The result has been that in Ontario, where Mr. Dagger's suggestion was adopted in part, there has been the highest rural development in all Canada, there being approximately 1,200 companies operating 68,000 rural stations, as compared with 33,000 urban telephones attached to the system owned and operated by the government.

* * * *

Of course, as a loyal Canadian and a prominent official of the telephone administration, Mr. Dagger is not disposed to draw any comparisons detrimental to government ownership, but his comments are significant.

"The experience of Ontario and Saskatchewan, in my judgment," says Mr. Dagger, "leads to but one conclusion, which is that the highest rate of development of rural telephone service is attained where the systems are established by local initiative and operated as separate units. The history of telephone development in Canada at least demonstrates that under centralized management, whether by a government or by a company serving a whole state or province, the best results cannot be attained.

"Therefore, the rural communities of America owe an eternal debt of gratitude to the pioneers who blazed the trail of

Independent telephony, as well as to all whose who are carrying on the good work today, without whose efforts the farmer might still be living in blissful ignorance of the daily doings of his neighbors and the world at large."

Coming from an outside observer, this comment is deserving of more than ordinary attention.

* * * *

The telephone is given a place of honor in the fine souvenir book compiled by the Union League Club of Chicago when it celebrated the dedication of its magnificent new $3,000,000 building. Judge Jesse Holdom contributed a chapter on "Chicago in the Early Eighties," the opening paragraphs of which will interest all telephone men.

"The telephone was a new and curious contrivance in 1879," says Judge Holdom. "The Chicagoan of those days who had been enterprising enough to put one of these instruments in his office carried a small card in his pocket. It had printed upon it his own name and 251 other names. That was the limit of the service. He belonged to a very small and exclusive group of people possessing this novel means for intercommunication. It was several years before telephones were extended to the residential districts.

COMING CONVENTIONS.

Telephone Association of Canada, Montreal, Windsor Hotel, October 12, 13 and 14.

United States Independent Telephone Association, Chicago, Hotel Sherman, October 12-15.

Illinois, Springfield, Hotel Abraham Lincoln, November 10 and 11.

Missouri, Kansas City, President Hotel, November 17 and 18.

South Dakota, Sioux Falls, January 13, 14 and 15, 1927.

Kansas, Manhattan, April 5, 6 and 7, 1927.

"When he wished to talk to one of the group, he did not refer to a number with a district designation. In those days neither was thought necessary. He merely called his number and gave the name of the person with whom he wished to converse. The operator made the connection.

* * * *

"Today the telephone directory numbers a few more than 1,300 pages, each page divided into five columns, and each column containing approximately 100 names—often more. The 251 have multiplied to 650,000. The vest-pocket card has grown to a book which needs a satchel to carry it—and nobody thinks of toting it about with him.

This growth is, of course, much more than a measure of the increase in Chicago's population in the intervening 47 years. It is a measure of the increasing enterprise of Chicago, of the vast development of business, of the widened social ramifications. As a matter of fact, population has increased in much lesser ratio than telephone users.

While the population of Chicago in 1879 was somewhat less than the total of telephone users today, it is now only about six times as great as then, while the users of telephones are 2,500 times as many. In 1879 about one in every 2,000 had a telephone; in 1926 about one in every 4½ was thus provided."

* * * *

All over the country, where such comparisons are made with the conditions of other years, the same story is being told. Telephone development has more than kept pace with the increase of population. That fact is strong evidence of the increasing dependence of the public on telephone service, and should serve as a constant challenge to the industry to keep abreast of the demand for its service.

Science and Research in Telephony

Most Insistent Demand for New Inventions Exists—Combination of Vacuum Tube and Telephone in Modern Inventions—Research Work in the Bell Laboratories—Paper Presented at Convention of Up-State New York Association

By Sergius P. Grace,

Commercial Development Engineer Bell Telephone Laboratories, Inc.

"Watson, we are on the verge of a great discovery!" These are the words that Alexander Graham Bell repeated over and over again to his assistant, Thomas A. Watson, during the days and weeks that Bell was inventing the telephone in the garret of No. 5 Exeter Place, Boston, in the winter months of 1875-1876. Thomas A. Watson, himself, just a few days ago, told me that these were the words Bell used so often in spurring him on to increased activity in the production of new models for trial.

Mr. Watson also said to me that Bell in his earlier days was one of the most ceaselessly active men in mind and body with whom he had ever come in contact. When they were experimenting at nights in the original telephone laboratory in Exeter Place, Bell's mind was constantly suggesting new experiments, and his bodily energy was so great that he was constantly on the move.

Mr. Watson was led to make these comments to me on viewing a talking motion picture to be exhibited at the Philadelphia Sesquicentennial, portraying Bell and Watson in the days when the telephone was being invented. He said that it would have been impossible for Bell to have moved around as slowly as the actor portrayed him.

Several years ago, when the resources of the country for national defense were being enumerated, General Carty was asked how long the Bell system had had a laboratory. To this he replied that the telephone was born in a laboratory in Exeter Place, Boston, and that all the tremendous subsequent development of the telephone system was due to the laboratory research work of the many scientists and engineers who carried on the work of Bell and Watson, the original telephone experimenters.

An analysis of the problems of telephony will show us that it is almost always the case that, in large cities where complex traffic conditions exist, there is the most insistent demand for new inventions. It has been the history of the past, and probably will be of the future, that the majority of new telephone inventions were developed for these complex city conditions and for long distance connections.

However, in the course of a few years these new developments become so well known and simplified that they can be applied with value to telephone problems in smaller communities. In this way there is a gradual flow of new methods and new apparatus to the smaller telephone com-

panies, such as are so largely represented in this association.

My talk today has to do with some of the recent research work in the Bell Telephone Laboratories, but before proceeding I should like to sketch briefly what, undoubtedly, most of you know, the general organization of the Bell system in America.

The Bell system is made up of the parent company, known as the American Telephone & Telegraph Co., which performs all of the general staff functions of the system, such as administration, finance, accounting, engineering and fundamental development, and also operates directly the long distance lines. Then, in each state, or in some cases, groups of states, there

"It Is Almost Always the Case That in the Large Cities," Says Mr. Grace, "There Is the Most Insistent Demand for New Inventions."

are operating Bell telephone companies, which furnish local and toll service to the public, and through contract with the American company, secure staff services and long distance connections.

In New York state, the Bell operating company is known as the New York Telephone Co. The hundreds of telephone companies in your association are, I believe in nearly every case, connecting companies of the New York Telephone Co. In this way your companies secure long distance telephone connections to every part of the Bell system as well as to other companies connecting with the Bell system in remote sections.

The manufacturing for the Bell telephone system is done by the Western Electric Co., which operates a very extensive manufacturing plant in a suburb of Chicago, also in Kearney, N. J. The laboratory research and engineering for all of the Bell companies, including the Western Electric Co., is concentrated in the Bell Telephone Laboratories, Inc., located at 463 West street, New York City. By this plan each individual operating company avoids the expense of a research organization; and by the consolidation into one group, it is possible to carry on research on a large scale and secure the keenest minds for each particular problem.

The Bell Telephone Laboratories occupy a 13-story building, covering almost an entire city square. The personnel numbers about 3,600, of whom approximately 1,700 are members of the technical staff. Some 600 or 700 of the technical staff have college degrees.

In order to present to you an idea of the wide scope of the Bell Telephone Laboratories, Inc., I can not do better than to give several quotations from its charter:

To carry on and promote investigation, research, experimentation and development in, or in connection with, or related to, the art or science of the transmission, with or without the use of wires, of intelligence and information of any kind whatsoever, including sounds, music, signals, photographs, pictures, characters or symbols of any kind whatsoever.

To carry on and promote investigation, research, experimentation and development in, or in connection with, or related to, the art or science of recording, preserving or storing in any manner, intelligence, sounds and information of any kind whatsoever.

To carry on and promote investigation, research and experimentation in the development of plans, methods, systems, ideas and inventions designed to secure safety, economy and efficiency in the equipment, construction and operation of telephone or telegraph or other electrical plants and systems.

The president of the Laboratories corporation, Dr. F. B. Jewett, is also a vice-president of the American Telephone & Telegraph Co. The general direction of the laboratories is in charge of E. B. Craft, executive vice-president.

Having given a general picture of the

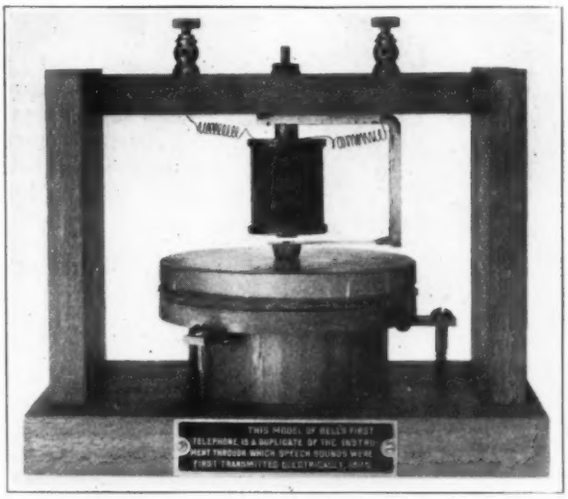


Fig. 1. Model of Bell's First Telephone.

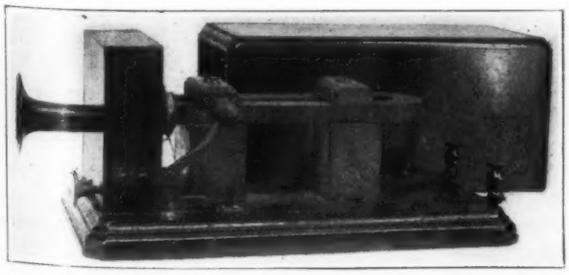
plan of the Bell telephone system, particularly with reference to research and engineering, I think it is in order to recount a few of the outstanding developments in the art of communication, which have resulted from this research work.

Bell's Original Telephone.

To begin with, I should like to show you a model of Bell's original telephone, Fig. 1, upon which, as a foundation, all subsequent inventions in telephone communication have been superimposed.

Another very interesting early telephone is known as Watson's "Thumper." This instrument, Fig. 2, is the commercial model which was designed by Watson immediately following Bell's original laboratory telephone. It is No. 32 of the first commercial lot of Bell telephones and was made by Mr. Watson's own hands 50 years ago this last spring.

Following Bell's original telephone, there were developed for the Bell telephone system hundreds of devices, such as switchboards, transmitters, receivers, paper-insulated lead-covered cables, etc., which I shall not take the time to describe to you.



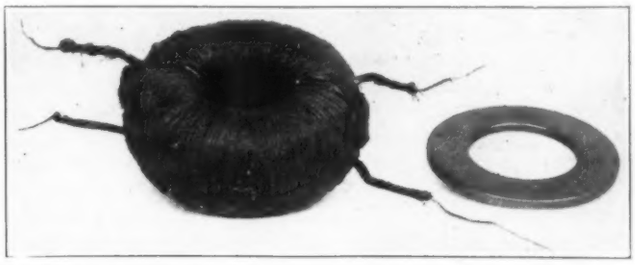


Fig. 2. Watson's Commercial Type Thumper Telephone.—Fig. 3. Cable Type Loading Coil and One of the Iron Dust Core Rings That Make Up the Loading Coil.

These devices, as well as those developed by Independent telephone engineers, you see in use every day in your own telephone companies. However, I shall call to your attention a few of the recent outstanding inventions and improvements

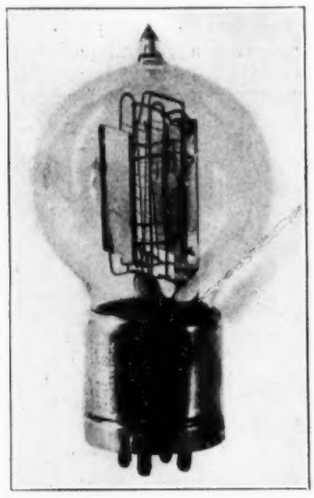


Fig. 4. The Vacuum Tube Repeater.

which are beginning to cause great changes in the telephone.

Loading Coils.

The telephone current, simulating the human voice, which is propelled through the wires by means of the telephone transmitter into which one speaks, has a frequency of vibration of 200 to 3,000 cycles per second. Because of the relatively high-frequency nature of telephone currents, they become rapidly attenuated or weakened when passing through wires in cables, or over long, open-wire lines.

Our mathematical and physical research work showed us that this weakening effect could be very largely counteracted by artificially loading the lines with what are known as "inductance" or "loading" coils. Through development extending over several years, it became possible to manufacture satisfactory loading coils, and they are now used in hundreds of thousands of circuits in the Bell telephone system.

The latest form of loading coil has a core made of compressed electrolytic iron dust, around which are placed carefully-balanced coils of wire. These coils are connected serially in a cable telephone circuit about every mile. The iron dust core was developed in our laboratories, and takes the place of former cores which were wound from exceedingly small soft Swedish iron wire. The iron dust cores are less costly than the iron cores, and are much better from a magnetic and electrical standpoint.

Loading coils in the Bell system have saved over 125 million dollars of investment that would have gone into larger copper lines without their use. I have in my hand a sample of the complete loading coil, and also one of the iron dust rings that make up the core, Fig. 3.

Although the rings appear to be of very solid iron, they may be readily broken with the fingers. A microscopic examination of each particle of electrolytic iron will show that it is magnetically separated from its neighbor by means of a thin film of zinc.

Telephone Repeaters.

Another most remarkable development of recent years is the vacuum-tube amplifier or repeater. Most of you are familiar with the vacuum tube as used in a radio set, but probably not many know that the vacuum tube first came largely into use as a device to repeat telephone current in telephone lines.

Even with the most powerful transmitters and the use of the loading coils as described, a telephone current rapidly dies away, unless excessively large wires are used to conduct it. In order that the economy of small wires may be obtained, it is necessary to have some form of repeating device in a cable telephone line about every 50 or 60 miles. The three-electrode vacuum tube has been developed so that it performs this function in a most perfect manner.

A weakened minute telephone current, coming over the line from a distant point, is led to the grid circuit of the vacuum tube. The changing potential on the grid, caused by the incoming telephone circuit, will vary enormously the number of electrons that can pass from the heated filament to the plate, and will, therefore, cause wide changes in a local electrical circuit, which are exactly similar to the incoming telephone current, but magnified many times. Thus, new current is sent into the next section of the line as often as is found necessary.

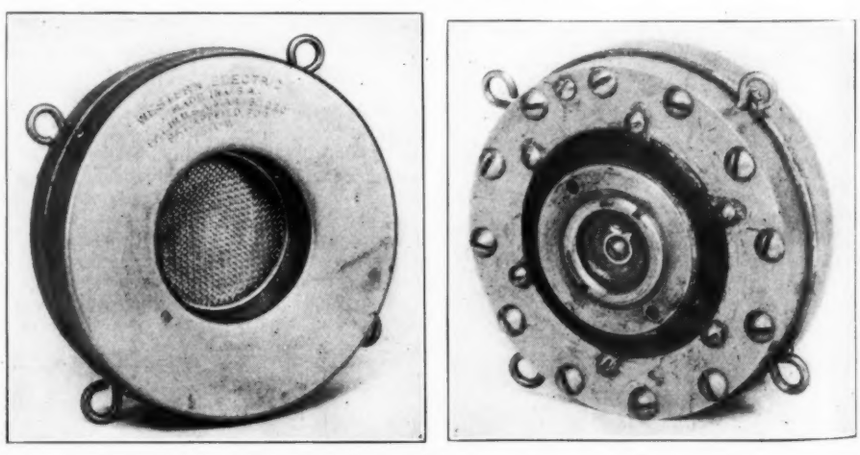


Fig. 5. Front and Rear Views of the Condenser Type Transmitter.

In the case of the long telephone cable from New York to Chicago, now in operation, there are 17 repeater stations. In a cable of this kind, telephone conversation is possible over wire not larger in diameter than an ordinary pin, whereas, the regular, open-wire circuits formerly used, required copper wire the size of a large wire nail. It seems altogether probable that by 1935 vacuum-tube repeaters (Fig. 4), will have saved in the Bell telephone system an investment of 200 to 300 million dollars.

Public Address and Radio Broadcasting Systems.

There is plenty of romance in the development of the more or less prosaic machinery just described, but when I come to the public address system in combination with the long distance telephone wires and broadcasting stations, I feel justified in becoming poetic, and ask that you permit me a short quotation from the ancient Greek epic poem, "The Illiad":

> And when they were now come where the most valiant stood, thronging about mighty Diomedes, tamer of horses, then stood forth the white-armed goddess, Hera, and shouted in the likeness of great-hearted Stentor with voice of Bronze, whose cry was loud as the cry of fifty other men.

Thus sung the poet Homer, in the era of Greek mythology. His reference to Stentor, a herald of the Trojan war whose cry was loud as the cry of 50 other men, shows the inherent desire which has existed in mankind since the dawn of history to magnify the human voice. The word "Stentor" has become a fixture in all languages, signifying the desire to speak so loudly as to make oneself heard throughout vast spaces.

From the time of Stentor down to a period within the last two or three years, no human being has ever possessed a voice equal to that of this character of mythology. It remained for the Bell engineers to turn mythology into fact, and today, through the Bell public address system, any man can have the power, not only of 50 voices, but of 50 thousand times 50 voices, and more. It is now a common occurrence for the president to speak in Washington so as to be heard practically throughout the length and breadth of the land. You, undoubtedly, have read

many accounts of these occasions in the public press, and have also listened to them on your radio sets.

The pick-up transmitter (Fig. 5) is of a type that faithfully reproduces all voice vibrations from 50 to 5,000 per second.

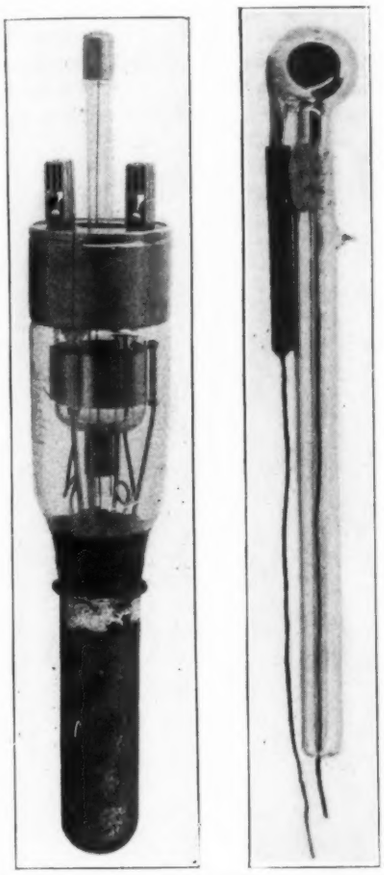


Fig. 6. A Ten-Kilowatt Radio Broadcasting Tube.—Fig. 7. A Photo-electric Cell.

The output of the transmitter is amplified by means of vacuum tubes and fed into a special network of the long distance lines of the American Telephone & Telegraph Co., for transmission to all the important cities in the country.

In each city it is possible to have public address systems installed in halls and parks for magnification purposes. The largest auditorium is easily filled with a sufficient volume of sound to enable a person in the rear-most seat to hear every word. In the open air, a crowd of at least 100,000 people can get close enough to a single amplifier to hear clearly.

In addition to the public address systems in halls and parks, connections are frequently made to radio broadcasting stations (Fig. 6) in the various cities. The incoming telephone current from the long distance lines controls the broadcasting stations and allows millions of people, through the medium of their radio receiving sets, to hear what is being said by the President in Washington.

Through these developments, it is now possible for a single man to make an appeal to an entire nation, provided they speak a common language. In the case of a great singer, even this is not necessary.

Multiplex Telephony.

I shall pass rapidly over another remarkable invention that is rapidly coming into use. This is known as the multiplex telephone, by means of which we are able to transmit five or more telephone conversations simultaneously over a single circuit. This is done by impressing on the telephone line high-frequency currents above the speech range. For example, there would be impressed on the telephone line carrier frequencies of 5,000, 10,000, 15,000, 20,000 and 25,000 cycles per second.

Each one of these carrier waves can be modulated by means of an ordinary telephone transmitter. At the receiving end, a demodulation takes place and each telephone conversation is led into its proper channel. The five carrier frequencies enumerated will each transmit a separate telephone conversation, although all carrier waves are passing simultaneously over the connecting line. Several thousand miles of circuits so equipped are already in use in the Bell system, saving many millions of dollars.

Picture Transmission by Telephone.

In addition to regular telephonic communication, the American Telephone & Telegraph Co. has entered the field of picture transmission over its long lines. Commercial apparatus is already installed in New York, Chicago and San Francisco, and a picture transmission service is being offered to the public at these points. Additional picture transmission stations will be rapidly installed in the larger cities. It takes about seven minutes to transmit a 5-inch by 7-inch photograph from New York to San Francisco.

There are two important features of the picture transmission mechanism which I shall describe briefly. The first is the photoelectric cell, which is a special form of vacuum tube that has the remarkable property of generating a minute electrical current in direct proportion to the amount of light that passes through a window and falls on its potassium-coated interior. It is one of the fundamental laws of nature, only recently discovered, that all substances generate electric currents of electrons whenever light waves, radio waves, radium waves, X-rays, or any other waves in the spectrum, falls upon them. Every time the sunlight falls upon a blade of grass, electronic streams of electricity are generated.

In the case of a photoelectric cell (Fig. 7), this property has been developed to a high magnitude, and when a pencil of light passes through an ordinary photographic film into a photoelectric cell, a varying current of electricity will be produced, which follows all the lights and shades of the original photograph.

At the receiving station the incoming currents control a device known as a light valve. This is a beautifully-made minute shutter, which opens and closes in consonance with the incoming changing currents, and permits varying quantities of light to fall on a photographic film. When this film is developed, the original picture is reproduced.

"Permalloy" Loaded Ocean Cable.

Last year there was installed between New York City and the Azores Islands the first section of the United States-Italian Cable. This cable is uniformly loaded with a magnetic material known as "Permalloy," a research development of the Bell Telephone Laboratories. In searching for ultramagnetic materials, our engineers developed an alloy of nickel and iron, which, when specially heat-treated, has very remarkable magnetic qualities. It has a permeability to magnetic force over 100 times greater than the very softest iron obtainable.

By wrapping permalloy in the form of a tape around the copper conductor of a submarine cable, a "loading" effect is accomplished, which makes the cable four to six times as fast as the ordinary submarine cable; or, in other words, one of the new cables will handle the business that would have required about five old-style cables.

The New York-Azores permalloy cable (Fig. 8) has been highly successful, and new world cables now being projected are having permalloy loading specified for them.

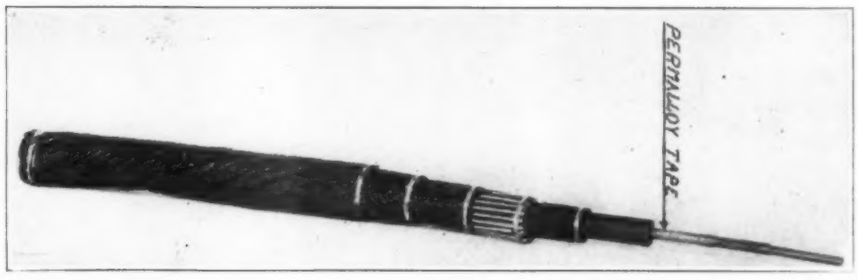


Fig. 8. Deep Sea Section of the New York-Azores Permalloy Loaded Ocean Cable.

Artificial Larynx.

The accomplishments so far described have had to do mainly with communication, but we are now finding that much of this fundamental research in the development of the communication art can be adapted to important and, many times,

humane uses in other field. As an example, take the case of the artificial larynx. Something like a year ago Dr. J. Edmund Mackenty, a prominent throat surgeon of New York, came to the Bell Telephone Laboratories. He said to us:

Fig. 9. The Artificial Larynx.

"I and my colleagues have developed the technique of the removal of a malignant larynx to the point where 98 to 99 per cent of those operated on, recover; but, unfortunately, while we save their lives, we take away their speech. Knowing of the research work in sound and hearing conducted by your laboratories for the improvement of the art of communication, I come to you and ask: 'Can you develop a talking machine to give back to these people the voices the surgeons have taken away?'"

Inside of a year, our scientists, led by Dr. Harvey Fletcher had produced the artificial larynx. Into a small, hard-rubber device much resembling Vice-President Dawes' famous "underslung pipe," come puffs of air from the lungs; a strip of thin rubber sets the air into vibrations; the waves carried into the mouth by a tube are modulated there by the position of the tongue, lips and teeth to form the sounds of speech. Of course, the person speaks in a monotone, and the quality is unnatural, but after some practice, he can readily be understood.

Every few days one of these devices is sent out to some unfortunate individual, who invariably writes back, "Thank God, I can speak again!" The Chief Justice of the Supreme Court of Cuba uses an artificial larynx to transact all court business.

Another most interesting case is that of a young man in St. Louis, who all his life had been afflicted with stammering. After hearing a lecture by radio on how the artificial larynx operated, he received an insight into the way in which human speech should properly be constructed. This was a revelation to him and, after a certain amount of experimentation, he found that he had cured himself almost entirely of his stammering.

Electrical Stethoscope.

I have with me an artificial larynx, but because my throat is a normal one, in order to operate it, I must use a bellows worked by my arm to simulate the action of my lungs. To show you what artificial speech sounds like, I shall use the artificial larynx (Fig. 9) to say a few sentences such as "How are you Mary?"

Another by-product contribution to the medical field is the multiple electrical stethoscope. In the electrical stethoscope there is provided a special transmitter, which, in contact with the patient's body, will pick up heart and chest sounds to the practical exclusion of other noises in the room. The current from the transmitter is magnified by means of vacuum-tube amplifiers and, in the case of a large medical

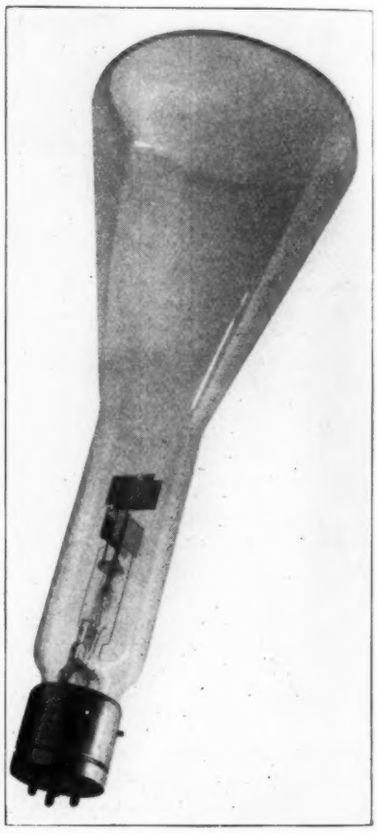


Fig. 11. The Cathode Ray Oscillograph

amphitheater, a telephone receiver is wired to each student's chair.

By placing the rubber tube from his individual acoustic stethoscope over a small pipe leading from the receiver, the student hears magnified the sounds from the patient's body. By means of what are known as electrical filters, it is possible for the operator of the electrical stethoscope to tune out various heart and chest sounds, and concentrate upon the particular one which it is desired to study. This is similar to tuning a radio set to the particular station it is desired to hear.

In this way, if a patient has a heart murmur, which ordinarily has a vibration rate of around 400 cycles per second, it is possible to tune out the fundamental heart and chest sounds and concentrate the attention of the entire class upon the magnified high frequency murmur. At the University of Michigan in Ann Arbor, a large multiple electrical stethoscope (Fig. 10) of our development is in use, and

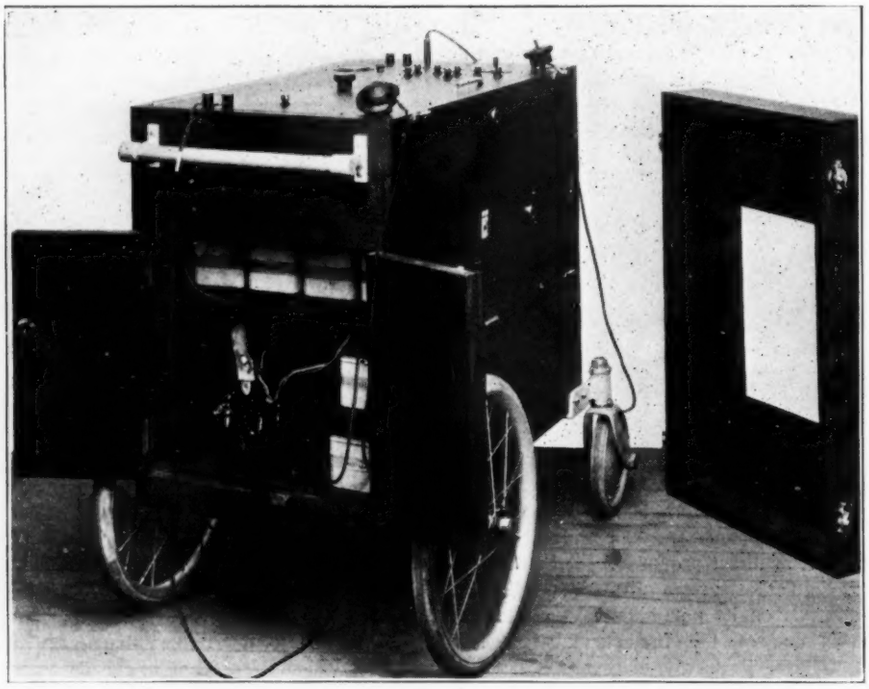


Fig. 10. The Multiple Electrical Stethoscope with a View of Interior.

the entire amphitheater is so wired that each student can listen. Other university medical schools are rapidly equipping themselves with this apparatus.

The latest development of our laboratories is the single electrical stethoscope, which is intended for private consulation. It was exhibited last June (1925) for the first time at the national meeting of the American Medical Association at Atlantic City. It was exhibited there in combination with the cathode-ray oscillograph.

The cathode-ray oscillograph (Fig. 11), another product of our laboratories, is a vaccum tube with a fluorescent end. A stream of electrons from a hot filament is made to impinge upon the fluorescent end of the tube, and wherever the electronic stream hits, there is produced a point of light. By influencing the electronic stream with the electrical current which we are studying, the point of light will trace a pattern on the screen, which shows in graphic form the nature of the controlling electrical current.

With this device we can study visually the consonants and vowels of speech, and in combination with the electrical stethoscope, the variations of heart and chest sounds.

Dr. Richard C. Cabot, professor of clinical medicine and professor of social ethics at Harvard University, is one of the greatest authorities on heart diseases and has written a number of authoritative reference works on the subject. In order to convey to his readers what a leaky heart sounds like, it was necessary for Dr. Cabot in his writings, to adopt a semaphoric code system. It was necessary for the reading physician to decode these symbols and convey to his mind an impression of what the original heart sounds like.

Dr. Cabot had long wished to make photograph records of typical heart cases to accompany his books, but there was available no suitable electrical pickup or recording apparatus until the advent of the electrical stethoscope, operated in conjunction with a system of electrical recording (Fig. 12), developed by the Bell Telephone Laboratories. Dr. Cabot's dream is now being realized and for the past several weeks he has been making in the Columbia Phonograph Studios electro-stethoscope records of human hearts in all their vagaries. These records will soon be available to physicians everywhere.

Curiously enough, the electrical stethoscope primarily developed for the medical profession, is finding uses in industrial fields. The manufacturers of automobiles are considering its use for the picking up and analyzing noise from gear boxes and other parts, which noises they hope to eliminate by improved acoustic designs.

The latest venture of the electrical stethoscope is as a device for the location of bridge and dock timbers damaged by marine boring worms known as "teredos."

Fig. 13. Listening for Teredos with the Electrical Stethoscope in Brunswick, Ga.

Throughout Southern coastal waters many millions of dollars are lost annually through the destruction of bridge and dock timbers by teredos.

Because teredos make only minute holes where they enter piling, the piling may appear in perfect condition, although the interior is practically destroyed. Each teredo has a head equipped with a boring apparatus which looks very much like a steel clam-shell bucket used for the unloading of coal from barges, and, obviously, in drilling his way through a pile, the teredo must make some noise. Our tests (Fig. 13) indicate that the slightest pin scratch on a piece of dock timber will be readily picked up by the electrical stethoscope and amplified so as to be plainly heard.

The Georgia Highway Commission appealed to the Bell telephone system for some form of sound detection device for the location of teredo infested timbers, and we are planning within the next month or two to place suitably-adapted electrical stethoscope apparatus at its disposal. It is hoped that with this detection apparatus, they can develop an inspection system that will save the Southern States many millions of dollars.

Electrical Recording and Reproducing.

In connection with our fundamental studies on speech and hearing, we found it necessary to develop a high quality system of speech recording. This is done by means of a special transmitter of the radio broadcasting type. The minute current from the broadcasting transmitter is amplified by an extremely high quality vacuum-tube amplifier. The electrical current from the amplifier drives an electrical cutting tool which is used to engrave a master phonograph wax record.

The old type of direct acoustic record-

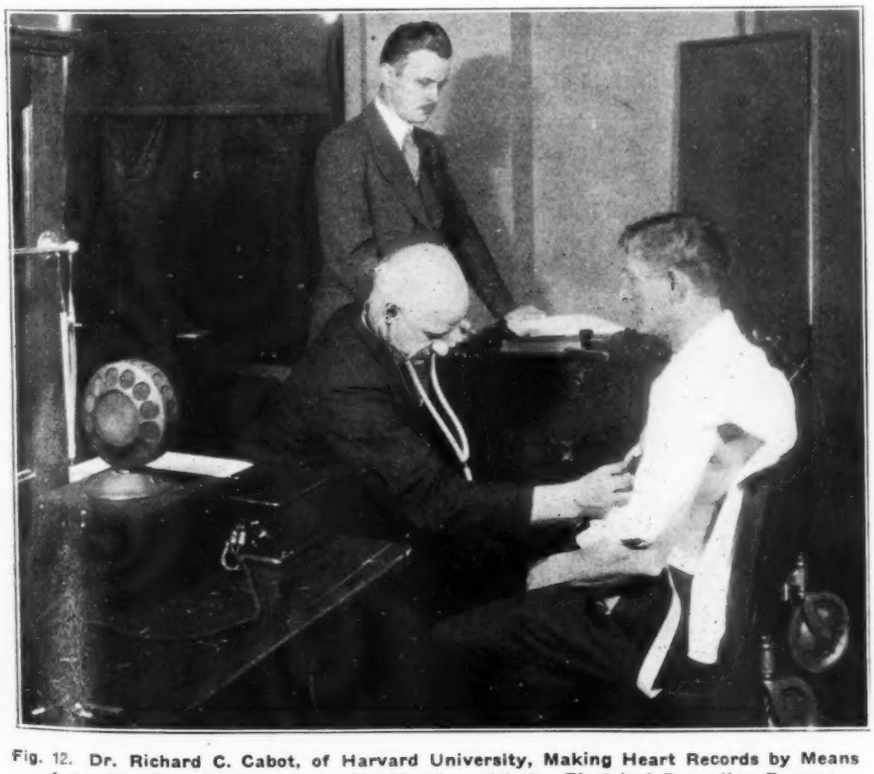


Fig. 12. Dr. Richard C. Cabot, of Harvard University, Making Heart Records by Means of the Electrical Stethoscope in Combination with the Electrical Recording Process.

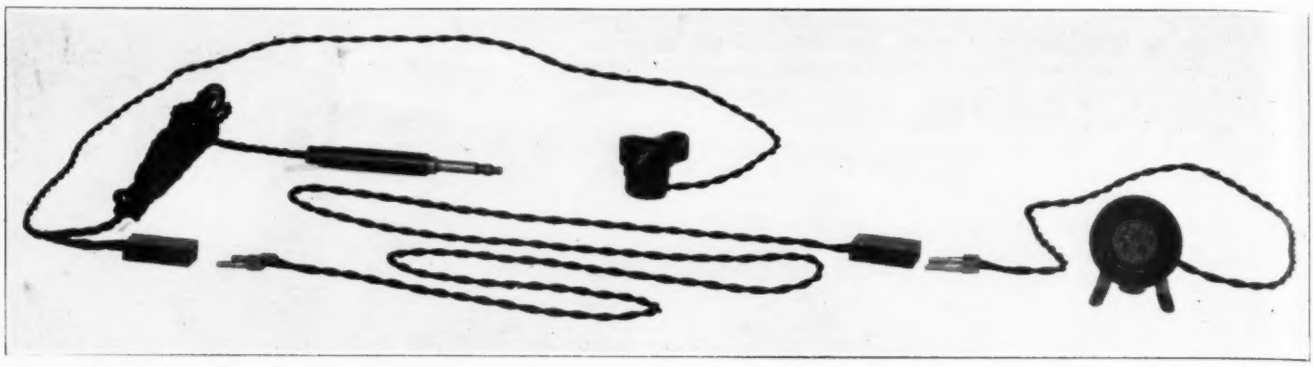


Fig. 14. Parts of Audiphone, Showing Midget Receiver and Telephone Transmitter.

ing did not engrave on the record frequencies much below 300 to 350 per second, whereas the high frequencies above 3,500 were practically all eliminated. The new method of electric recording puts on the record frequencies as low as 90 to 100 and up to 5,000 to 6,000 per second with a practically flat characteristic all the way through. This range covers all of the speech and music frequencies that are of any consequence.

For reproducing from the record, two systems are available. First, the straight acoustic principle in which, by means of a special design of needle arm, diaphragm and horn, there results a matched impedance of all the parts, including the sound chamber, which permits all of the frequencies from 90 to 6,000 per second, to be emitted without distortion.

The other method of reproducing speech or music from a record is entirely electrical. In this apparatus, an arm connected with a needle vibrates between polepieces, thus producing an electrical current simulating the sounds engraved on the record. This weak current is amplified by means of high quality amplifiers, which amplifiers in turn operate loudspeakers of the large cone type.

Both the Victor Talking Machine Co. and the Columbia Phonograph Co. are using the system of electrical recording developed in the Bell Telephone Laboratories. In the case of the Victor Talking Machine Co., its new orthophonic Victrola, which is entirely acoustic, makes use of a system of matched impedance and is a development of the Bell Telephone Laboratories.

Audiphones.

To assist those who are hard of hearing, the Bell Telephone Laboratories have recently developed a hearing aid in which the ear-piece consists of a midget telephone receiver manufactured from permalloy. By using permalloy it is possible to make a receiver one-eighth the standard size and yet have the same efficiency as the large receiver.

This midget telephone receiver is fastened to a specially-molded ear-plug that fits into the outer chamber of the ear (Figs. 14 and 15). Each ear-plug is specially molded from a cast, the same as a dental plate.

Audiometers.

Our research engineers, particularly Dr. Harvey Fletcher and R. L. Wegel, have made exhaustive studies in the human mechanism of speech and hearing. They saw an opportunity to apply a number of their discoveries to the field of otology.

Working in conjunction with the foremost ear specialists, a line of audiometers has been developed which enables the otologists to measure with extreme precision the hearing of any individual throughout the entire range of speech frequency. Otologists tell us that the precise and dependable results from these instruments are most helpful in their practice and research work.

The latest audiometer, known as the phonograph audiometer (Fig. 16), will be of special interest to those who have children or who are responsible for their education.

In recent years it has been realized that many children make poor school grades, or even fail, not from any mental deficiency, simply because they do not hear. In an effort to be of help, some children with slightly reduced hearing, have really been harmed by segregating them with those who are much more deaf. What was wanted was a quick, reliable means of dividing children into groups according as they hear, or do not hear, speech of a particular degree of loudness. So our engineers proceeded to develop an audio-

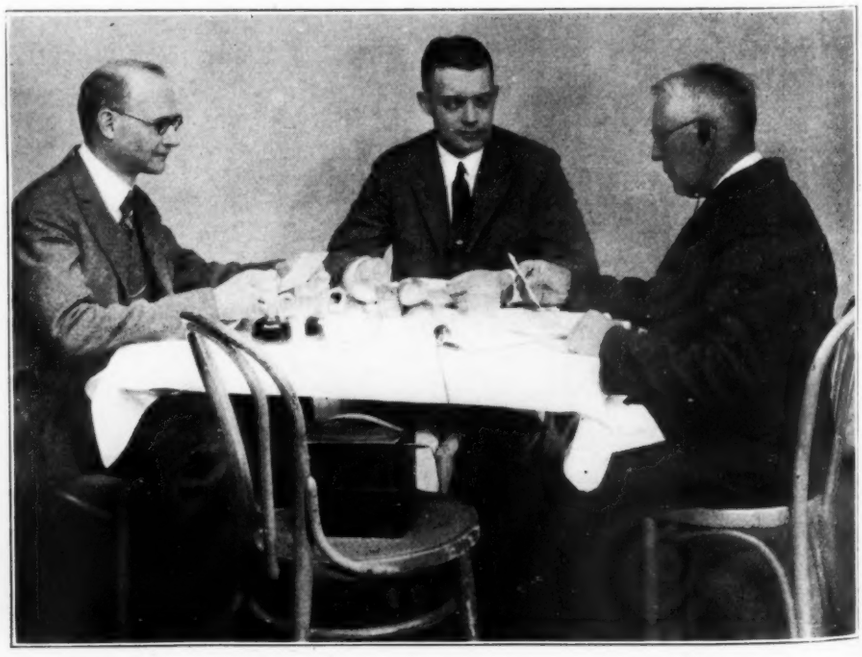


Fig. 15. Midget Receiver and Transmitter. A Conference Over the Lunch Table Showing Use of Audiphone.

meter wherein speech from a phonograph record is electrically reproduced in a dozen or more head telephone receivers so a number of persons could hear the phonograph at the same time.

In making the record, various groups of numbers are spoken in steps of loudness, first diminishing, then increasing. An entire schoolroom can be tested simultaneously. Listening, the children write down all they can hear. From a key chart compared with their papers, there is obtained their percentage of hearing loss.

When this exceeds a certain amount, the child should be referred to an ear specialist for attention. Probably 75 per cent of these very deaf children can be cured of their deafness, or at least greatly

Fig. 16. Audiometer Designed for Rapidly Testing the Hearing of Large Groups of School Children.

helped, if given special medical attention at an early age. Those only partially defective in hearing should be given the front row of seats in school, and in the majority of cases the supposed dullness will disappear like magic, for then the children can hear their teacher.

Wonders never cease, and as many of you, undoubtedly, noticed in the newspapers and telephone journals, the engineers of the Bell telephone system have achieved direct telephone communication between New York and London. These telephonic talks between New York and London have been taking place each week-end during the past months on an experimental basis.

There is no end to research, and under the ceaseless compulsion of the mind's desire we must always go on and on in that search for the truth which lies in the realm of mystery. One by one we will turn the infinite pages of the book that has been written by the Hand Divine.

Operators in Different Sections Take Correspondence Course.

Interest in the correspondence course in long distance operating of the United States Independent Telephone Association has increased since the termination of the vacation period.

Many letters have been received by the association from chief operators asking whether it would be permissible to call operators together in group conferences for the purpose of discussing each lesson before they attempt to prepare their papers.

The grading committee is heartily in accord with this procedure. However, the chief operator should act only as a coach, asking such questions as will lead operators to think for themselves. She should discuss the requirements of each question thoroughly, for it is found in the grading of lessons that many operators fail to answer some parts of questions, answer more than is required, or answer in their own words when a phrase is required. Operators should not write up their papers in group meetings.

Many of the letters the grading committee has received are interesting as they indicate what the course is accomplishing. The following are a few of them:

"I, for one," writes a Michigan operator, "believe this course is very instructive. I thoroughly enjoy answering my questions after a hard day at the office. I was delighted with my first grade. I hope I shall continue to do as well."

A Kansas chief operator writes:

"I am sincerely enjoying the correspondence course. My operators also think the course is very interesting as well as instructive. What a pity that every operator, supervisor, and chief operator cannot have this course.

If the managers of all of our tributary centers could only realize what it would mean to their operators, they surely would enroll their entire force of operators. While some of the questions do not exactly apply to their work, yet it would be of much interest to them to know how their toll center handles those phases of the work."

"With lesson five I cannot resist writing you a note, as this is half through," says an Illinois operator. "In Mr. Deering's letter enclosed with the last lesson, he asks if we are getting real pleasure out of it, and I am glad to say that this is a mild way to express it."

"I thought I would tell you how much I have enjoyed this correspondence course. I can hardly wait for my next set of questions," comments a Texas girl.

Another Illinois operator writes:

"Since my enrollment in the correspondence course, I have learned more than I hardly knew was required to be a good toll operator. My desire is to be a No. 1 toll operator."

"Many hands make tasks a pleasure," is the spirit of the Arizona operator who says: "We operators study our lessons together. Is this permissible? We debate a while until we both get the right answer. It makes it very pleasant work."

"I feel that I am getting a great deal out of this course, and the other operators in our office think the same," writes an Iowa operator. "There are a great many things we did not know, since we are tributary operators, but I think we can cooperate better with out toll centers if we have some knowledge of the steps she is taking. We get more good out of our Toll Reference Text Book by having questions to look up instead of studying at random."

"I take this opportunity to thank the United States Independent Telephone Association for an opportunity to enroll as a student in the correspondence course. It not only enlarges my knowledge along the line of operating, but also gives me real pleasure in preparing the lessons." That is the appreciation of the course from a Pennsylvania girl.

"Sound Finance," Topic for National Convention; News Notes.

The United States Independent Telephone Association will hold its annual meeting and convention at Chicago, October 12 to 15. The association has sent out notices of the annual meeting to its members and of the general convention to non-member companies. The convention and exhibits will be held at the Hotel Sherman, whose convention floor furnishes better facilities for the association's meetings than can be secured elsewhere.

The railroads have made a reduced rate of 1½ fare on the certificate plan. When the ticket is bought at the regular rate, a certificate or receipt is issued by the railroad agent, which, when countersigned by the secretary of the association, entitles the purchaser to buy his return trip for half fare.

As to program, the main topic of the general sessions will be the financing of telephone companies—"not high finance nor low finance but sound finance." On account of the many changes in ownership of telephone properties this past year and consequent financing, this subject is one of very great interest.

The three technical divisions will each start its program with a lunch, followed by a short program and open forum.

The Pioneers will stage their "best ever" entertainment on the afternoon of Thursday, the third day of the convention.

Missouri Convention to be Held at Kansas City, November 17-18.

The Missouri Telephone Association will hold its annual convention this year at Kansas City, at the President Hotel, on November 17 and 18 according to recent announcement of Secretary R. W. Hedrick, of Jefferson City.

Operators—Securing of New Business

How Can the Operator Assist in Obtaining New Business—A Contented Subscriber Is an Avenue of Advertisement—Paper Presented at Traffic Conference Held During Rochester Convention of New York Up-State Association

By Miss L. B. Arnold,

Traffic Supervisor, Otsego & Delaware Telephone Co., Oneonta, N. Y.

Operators can be of material assistance in obtaining new business for their company by making the service they render to present subscribers of such a high quality that patrons will not only be satisfied but be well pleased with the attention they receive. A contented subscriber, who is pleased with the service he receives, is almost always certain to be a salesman for the company, for he will advertise the fact generally at every opportunity—and we all know that it pays to advertise.

How can we as operators make our service 100 per cent? By making the contact between the patron and the operator most pleasant and satisfying.

As we are allowed to use only certain words and phrases, they must be spoken in such a way that by their inflection and modulation they will greet the subscriber in a pleasant and interesting manner and above all, be courteous. In the application of these simple rules, the local operators will automatically make the phrase "Number, please?" sound like a greeting, while the statement, "I beg your pardon" will be taken as an apology, and the words, "They do not answer," will unmistakably convey a tone of sincere regret.

Of course, a smiling tone of voice will not always appease an irate subscriber who has been obliged to wait some 15 seconds or more, either excusably or inexcusably, to reach Central, or who has held the line for three minutes on a delayed call without receiving any kind of a report—but it will help, and help a lot. "A soft answer turneth away wrath."

There is no question that fewer errors are made when operators repeat the number distinctly, using the style-strip method, for if the number is repeated in this manner with a rising inflection at the end, patrons will correct the operator if repeated wrong or acknowledge a correct repetition. The new way of enunciating the figures five and nine, as outlined in the A. T. & T. Co.'s bulletin, has reduced the number of complaints from subscribers who have these two figures in their own number.

Rural subscribers on multi-party lines, especially where open ringing is used, would not only be better satisfied but much pleased if the operators would take pains to space the line rings evenly and distinctly. Subscribers on these lines are, as a rule, not always near their telephones and, unless the rings are given distinctly, will answer the call unnecessarily, causing not only confusion but a feeling of unpleasant criticism toward the company.

Few subscribers and patrons, as a rule, have any conception of how a central office looks or how it functions. Hence, even a meager explanation by an employe is always interesting to a layman. Operators in their contact with patrons outside the office, at social gatherings or other functions, can be boosters for the company by answering questions or inquiries as to how calls are handled; why charges on a call in one case are higher than another; how the operator knows when a line is busy, etc. If the operator is unable to give an intelligent answer, ask the patron if he or she would like to see a central office; and if so, say you will ask the chief operator to arrange for a visit. In all such cases do not fail to make the report to your superior.

Often the public is liable to gain an erroneous impression of the company and its service by carelessness and thoughtless conduct on the part of its employes when off duty. During relief periods operators should not make a practice of leaning out of the windows of the retiring room with their operating sets on, for that might create an impression that the operators have very little to do, and poor service is easily attributable by passersby to some such indirect cause.

The intelligent handling of service complaints by the chief operators, and the following up of these complaints, will often change a chronic kicker to a booster.

Toll operators can materially encourage the use of long distance lines by maintaining a high class of service. The recorder through courtesy, accuracy and speed in recording a call can create an impression that the operator desires to handle the call in the most expeditious manner.

The little courtesy phrases, "Please," "Yes, sir" and "Thank you" are small words but their use means a great deal in promoting good feeling on the part of the subscriber toward the company and yourself. The personal use of the subscriber's name together with the phrase, "Thank you" is especially liked by patrons as it tends to show by recognition a more personal appreciation of the subscriber's patronage.

Our toll operating practice advises us to ask, "Do you wish to make this a person-to-person or a station-to-station call?" in cases where the calling party names a particular person and gives only the address or otherwise fails to indicate clearly by the details of the call whether person-to-person or station-to-station service is desired. By asking this question, fewer complaints are received from subscribers whose intention was to file a call at the lower rate and who later find on their bill an amount larger than expected, and they thus might be inclined to consider the rate exhorbitant.

Give prompt reports to patrons, even though you have only an indefinite report to give. Especially try to keep patrons at public telephones frequently advised of the status of the call.

If the called party is out, do not give that meager report to your subscribers. Make an effort to find out what time the called party is expected, if he can be found at another telephone, or if there is someone who is authorized to talk for him.

If a report of "no telephone" is received, try to find out if a better address can be furnished; if not, always suggest sending a messenger.

Always endeavor to pass an unsatisfactory report to a subscriber in such a pleasant, interested and encouraging manner that he will feel you have done service. (*Please turn to page 26.*)

Value of Persistent Friendliness

Tact, friendship and foresight, are three valuable qualities. Many a man is holding a position of honor and distinction because of his loyalty to his firm, loyalty to his fellow men, and his persistent friendly attitude and tactful mode of approach on matters where differences of opinion may be quite well set or deeply-fixed.

Friendship is the civilizing cement that binds individuals, families, communities, and states together. The man who is persistently friendly will get on well. For just as the direct product of conscientiousness is credit at the bank and credit among one's fellow men, so the direct product of true friendship is opportunity.

Generally speaking, higher types of men and women will do out of friendship for one of their friends that which they could not be hired to do. Money could not induce them to exert themselves in such a manner.—Dr. J. M. Fitzgerald, vocational counselor.

A·T·M [STROWGER] LEADS IN GREAT BRITAIN

at NOTTINGHAM

—King Charles I inaugurated the historic struggle of the Civil War which endured for ten years and which furnished the incidents for the ever popular romance of Cavalier and Roundhead.

Nottingham again features in the raising of a standard, the particularly modern one of telephone communications. A. T. M. (Strowger) Automatic Telephone Equipment is in process of manufacture for Nottingham and, as elsewhere, when installed will inevitably raise the standard of communication in that city.

AUTOMATIC TELEPHONE MANUFACTURING COMPANY LTD

STROWGER WORKS
MILTON Rd EDGE LANE
LIVERPOOL

STROWGER AUTOMATIC TELEPHONY
MAX ATM
The System The Operator The Symbol

ENGLAND

LONDON OFFICE
NORFOLK HOUSE · NORFOLK St
STRAND·W·C·2

South of the Equator

The original walls of the city of Buenos Aires were built by Don Pedro de Mendoza in 1535. On this ancient site stands modern Buenos Aires, the "Paris of the Western Continent"—a city of beautifully designed buildings, extensive parks and wide boulevards.

With a population of over two million this great city is the central point for varied commercial and industrial activities. Early in 1919 the United River Plate Telephone Company began the installation of Strowger Automatic equipment in Buenos Aires, realizing, largely through their own experience, that the telephone traffic needs of the future could be met satisfactorily only by automatic means.

Even before this, many other exchanges in the Argentine operated by the same company, including Cordoba, La Plata and Rosario, were supplying their telephone users with modern service through the use of Strowger Automatic equipment, furnished by Automatic Electric Inc., the originators and pioneer manufacturers of Strowger Automatic telephone equipment.

STROWGER AUTOMATIC

Automatic Electric Inc.

Factory and General Offices: 1033 West Van Buren St.
Chicago, U. S. A.

When writing to Automatic Electric Inc., please mention TELEPHONY.

GOLDILOCKS AND I GO FISHING

By Miss Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

A new cafeteria opened for business alongside of a reputable old cafe in a certain little city. This new cafeteria, in its glistening dress of white and green, its bright lights, brass fixtures, and handy food counters well-stocked, certainly appealed to my eyes and my appetite became keen-edged when I saw it for the first time. So I turned my feet into the doorway with no qualms of conscience for passing up "Justrite," my good old seven-days-in-the-week stand next door. As I sat there with my food spread out on the arm of my chair and saw the crowd coming and going, I thought: "I wonder how many of these customers are Justrites."

I initiated this new procedure into my daily program for about a week. Although everything seemed pleasing to the eye, ear, taste, and smell, I seemed to miss something that I had always enjoyed next door; an indefinable something.

This morning that indefinable something moved me right past Newplace cafeteria, and I did not resist. In approaching Justrite's entrance, I noticed a small card in the window which read, "You will see the same faces here, daily."

"Let's go in," that indefinable something whispered to me. Ah, how good it felt to be back in the old place! To see the familiar faces; to sense the feeling of complete satisfaction.

As I sat there eating my food which was, as described by little Goldilocks in the story of "The Three Bears," said, "Neither too hot nor too cold, but just right," I thought of the real honest-to-goodness meaning of the words on that card in the window. Indeed, it meant much more than seeing the same people there day after day.

Why were they there. Perhaps, like little Goldilocks and myself, some of them had done some shopping around, not because they were dissatisfied, but . . . well . . . just because, mostly.

Anyway, here we were back at the home goal feeling as glad as the Prodigal Son. Yes, but why were we back?

It was because of a combination of many things: The cozy surroundings made us feel at home; the system and dispatch in which our orders were handled; the cleanliness; the pleasant-voiced women who gave no hint that they rendered "tip" service; the food which was "neither too hot nor too cold, but just right"; and the familiar faces.

Then I became conscious that this indefinable something, which had been my elbow companion for the past week, had given place to a sense of keen satisfaction.

MORAL: Follow the swallowers who swallow where regular swallows swallow—if you want to be happy and satisfied.

(*Concluded from page 22.*)

Very few users of long distance service know that a delayed call can be carried forward to the next day for completion without any further charge, so encourage a patron to allow you to try and complete his call later, tomorrow, or from another telephone as the case may be.

Supervise the call while in the process of timing so that you will know positively if a patron has experienced any trouble during the course of the conversation and can adjust charges accordingly.

If he does not complain but you know he did not have good transmission, always notify the supervisor. She will call him back at the end of the conversation and advise him to the effect that the charges have been reduced. In other words, make the service as given on each toll call of such a quality that after the final report has been given, or conversation has taken place, the subscriber will say to himself or to another, "That's real service."

Operators in small exchanges where the switchboard and booth are in the same room, have gained new business for the company by suggesting to non-subscribers who patronize the central office, that the rates for telephone service are low, in fact less than 10 cents a day.

I know of one business man who spent a great deal of his time waiting in the central offices for toll calls, walking the floor, etc. This go-getter of an operator approached him about having a telephone in his office, outlining to him that he was wasting time waiting in the office for his toll calls, as they were often made to some point of considerable distance. Today, he is one of our best subscribers and toll users—and he is not sitting in the central office, wearing out the operator's patience inquiring about the status of his call, but is complacently attending to his business at the same time the calls are being put through.

A monthly record of calls received for non-subscribers is kept at all of our exchanges. New stations have been gained in many instances by informing the people whose names appear on this report that they are having so many calls per month, and that because of inadequate messenger service in small offices, in some instances, they are missing their toll calls.

To sum up the whole matter, Henry Ford had the right idea when he said "The thing we must bear in mind is service." Service—that's the thing! We should give service. The individual should give it in his work; organizations should give service. Service brings prosperity. Making money isn't important. The important thing is to give service. Then you can't help making money."

State Telephone Co. Buys Eagle River (Wis.) System.

The State Telephone Co. of Wisconsin, with headquarters in Madison, has purchased the system of the Eagle River Telephone Co. William H. Radcliffe, present manager of the company, will remain in that capacity.

The Eagle River Telephone Co. has over 400 subscribers and operates 80 miles of toll line. The State company has about 20 exchanges in various parts of Wisconsin. C. J. Jackson of Seymour is president, F. N. Kneeland of Chicago, vice-president, and John A. Pratt of Madison, secretary.

Washington Association Plans for Greater Activity.

"More Action and Better Cooperation" is the watchword for the Independent Telephone Association of Washington for the year 1927 and the years to come.

There are 125 Independent telephone companies in the state of Washington eligible for membership in the state association, and an organized effort is now under way to secure the active cooperation of every company in the organization, according to J. W. Baker, secretary.

"Big things are being planned for the Independent Telephone Association of Washington for next year and for the years to come," states Mr. Baker. "We are now working out plans so that the Washington association will be in a position to render a big service to every member.

"One of the first things we are going to do is to enlist every eligible telephone company in the state in this organization and combine them in a unit that will prove of much benefit to each individual mem-

THE HOME OF THE
National Telephone Convention
WILL BE THE
NEW HOTEL SHERMAN
October 12-15

Telephone men congregating in Chicago for the U. S. Independent Telephone Association's annual convention will be delighted to know that the very hotel at which the convention will be held has facilities large enough to assure you that there will be no waiting for room assignments—a room for you whenever you arrive. Our watchword is "Save the guest's time." When registering at the New Hotel Sherman, you will not be greeted with that vexatious "Please register now and we will assign you just as soon as a room is vacant." You will be given prompt and courteous service and will be able to enjoy a room in the same hotel where the convention meetings are held and the exhibits to be seen.

No Waiting for Rooms

The Hotel Sherman has always been Chicago's convention headquarters. We have considered it a special privilege to serve so important an industry as the telephone field, and we appreciate the patronage of the National Telephone Association and telephone men. We are able to offer a vastly augmented service for large assemblies—halls, equipment, and facilities not to be found in any other hotel in the world.

Home of Telephone Men

During the past several years Hotel Sherman has been the home of telephone men during convention time. We know that this year, as before, you will be particularly pleased with Hotel Sherman's service, and we take this opportunity to welcome the telephone executives. Send in your reservations today!

Popular Features of New Hotel Sherman

1,700 Rooms, each with bath. The internationally famous *College Inn*. The *Bal Tabarin*, America's oldest and most exclusive supper club. *The Old Town Coffee Room*, decorated by Tony Sarg, a restaurant with an atmosphere reminiscent of pioneer Chicago. A large, new main restaurant. A floor exclusively for women. A floor for tall guests. A club-valet service hitherto unknown in Chicago hotels. A new entrance on Randolph Street, giving direct passageway to desks and lifts. Seventeen high-speed elevators, centrally grouped. Expansive new lobbies and lounges with furniture grouped after the European fashion. Large commercial exhibition hall equipped with all facilities for handling and operating every type of exhibit. Huge banquet hall seating 2,600 guests. And many other appealing innovations.

NEW HOTEL SHERMAN
RANDOLPH, CLARK, LAKE AND LA SALLE STREETS, CHICAGO

When writing to Hotel Sherman, please mention TELEPHONY.

Some of Those Who Attended the Minnesota Telephone Association District Meeting Held at Roseau, Minn., August 13.

ber. In the past, the one outstanding service given the members of the association was the annual convention at which topics of interest to every telephone man were discussed. According to the plans now under way, advice and assistance on all telephone questions will be given to members throughout the year and a united stand will be taken on all questions affecting the telephone industry.

At the annual meeting of the association held at Ellensburg, Wash., a few weeks ago, which was attended by more than 100 delegates, a committee was appointed to formulate the plans of activity for the association in the future. This committee is now actively engaged in laying the foundation for a bigger and better association."

At the Ellensburg convention, W. M. Anderson, president of the Farmer's Telephone & Telegraph Co. of Wenatchee, was elected president of the association, and J. W. Baker, of The Interstate Utilities Co. of Spokane, was re-elected secretary-treasurer.

The 1926 convention was one of the best and most profitable held by the association, according to Mr. Baker.

Radio Broadcasting Stations in Every Corner of World.

The steadily increasing popularity of radio throughout the world is strikingly revealed in a trade bulletin made public this week by the U. S. Department of Commerce. While the United States is still supreme in the radio field—having three-fifths of the world's broadcasting stations and five times more receiving sets in use than any other country—foreign nations are awakening to the immense possibilities of radio as a medium of education and entertainment.

Last year radio equipment exported from the United States was valued at $10,000,000, which was 80 per cent more than the value of shipments in 1924 and ten times the figure for 1921.

Broadcasting stations, according to the report, are now operating in every corner of Europe; there are stations in the larger cities of South America, Australia and South Africa. Japan and India in Asia also have broadcasting stations, although radio development naturally has not been so great in these countries as in other parts of the world.

These broadcasting stations range in power from 16,000 watts at Daventry, England—a super-station built for foreign broadcasting—to numerous smaller stations of 1,000 watts and less scattered throughout the world.

The United States, the report points out, is the only important country where the radio fan can listen in free of charge. License fees exist in almost every country, ranging from the nominal one franc per year in France to $18 in Salvador and $13 in Lithuania. In the British Isles the fee is 10 shillings; in Sweden about $2.70; Japan's fee is 80 cents; and the Union of South Africa, $1.25.

Along with license fees in many countries there exists rules and regulations of various kinds in connection with radio broadcasting and reception. In Greece, for example, only a Greek can own a radio set and even he is subject to government restrictions; Germany does not allow persons of Slav origin to own radio sets; the Latin American countries have also numerous regulations which must be observed by radio operators.

Next to the United States, the report shows, the United Kingdom has gone the furthest in radio development with 35.6 sets per thousand population. Sweden ranks next with 30.3 sets per thousand population, followed by the Union of South Africa, Denmark, Austria, Germany and France.

The development of radio in Sweden has been outstanding, the report reveals. Up to about the beginning of 1924 there was practically no market at all for radio equipment, largely because of the total lack of broadcasting and government restrictions. On March 31 last not far from 200,000 sets were licensed throughout the country.

The type of matter broadcasted from the various foreign stations varies widely. Much attention is given to music and there is a general absence of "jazz." The programs differ from those of this country in that much more attention is given to current news, and there is a tendency in some sections to use the radio for advertising. In Brazil a radio society is preparing to broadcast daily for the benefit of the wealthy planters in the state of Sao Paulo all the latest coffee news together with quotations.

In Northern and Central Europe the climate is ideal for continuous radio reception. The German in Berlin can tune in without trouble and listen to a musical program broadcasted from Rome; getting Paris is no feat at all and the stations of Northern Europe may be easily heard. The Frenchman and the Englishman likewise find the whole of Europe at their beck and call.

The rapid development of radio indicates that it is following the course of the automobile, the phonograph, and other modern inventions which have added to the pleasure and comfort of mankind.

Dog Uses Telephone to Obtain Release from Locked Store.

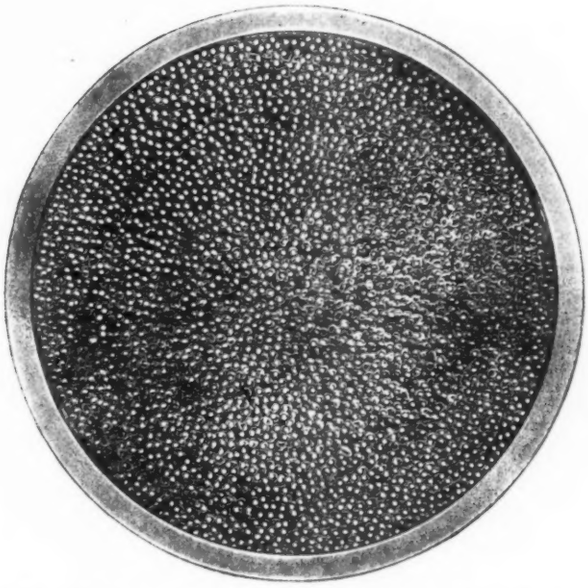
The Nebraska papers are carrying a story of dog intelligence so acute that when the animal found itself accidentally locked up for the night it used the telephone instrument in the store to call attention to its unaccustomed plight. The incident is laid in the town of Trenton, Hitchcock county, in the southeastern part of the state. The storekeeper's dog had always slept in the house, but this particular night its presence in the store was not noted when it was locked up.

About 2 o'clock in the morning the night operator on the Trenton exchange noticed a signal had flashed on the line. In the small towns, for matters of economy as well as for convenience, it is common for storekeepers to take a service that consists of party-line connection of the store and the home. This was the case in this instance.

Answering the signal the operator could hear no sound save that of low moaning. As she could not ring the subscriber with the line open and fearing that accident or tragedy had stalked into the home, she called relatives, roused them up, and told them of what had happened. They rushed over to the house, but found everything all right. When the store was visited, they found the telephone lying on the floor, with the family dog standing by it whining.

The storekeeper says that what probably happened was that the dog, in seeking a way out, had knocked over the instrument and realizing he had done something culpable, promptly sat down and whined about it. He has no objections, however, to any person of an imaginative turn of mind figuring it out as a case of lonesomeness on the part of the dog and a determination on his part to make the outside world know about it.

TELEPHONE CABLES



**1,200 pair 10 lb. air space Telephone Cable 3⅛ in. dia.
as made at our Cable Works, Prescot, England**

B. I. Telephone Cables are giving highly satisfactory service in many parts of the world. Their low conductor resistance and low electrostatic capacity conduce to high speaking efficiency.

BRITISH INSULATED CABLES

LIMITED

Cable Makers and Electrical Engineers

PRESCOT, LANCASHIRE, ENGLAND

When writing to British Insulated Cables, please mention TELEPHONY.

Company Given Unique Distinction

Coos & Curry Telephone Co., Marshfield, Ore., Designated as Most Westerly Company of United States—Largest Independent Company in the State and Especially Well Managed Accerding to Chief Engineer of State Commission

By Frank Russell,

Representative of the Kellogg Switchboard & Supply Co.

The Coos & Curry Telephone Co. operates the most westerly telephone properties in the U. S. A. It renders a universal service in western Douglas, Coos and Curry counties in Oregon and Del Norte and northern Humboldt counties in California. It is the largest Independent telephone company in the state of Oregon. The magnitude of its system can be realized when it is known that it has 25,449 poles in this entire system, together with 2,665 miles of aerial wire and 3,409 miles of wire in cables.

The Coos & Curry Telephone Co. owns the toll lines, as well as the local lines, with its own territory and operates without competition. There are 12 exchanges in its system, all of which are connected by adequate toll lines. The larger exchanges have the most modern equipment with many semi-automatic features. This company's service and management have been complimented many times by both laymen and engineers. The following statement was made at a hearing by Chief Engineer Green of the Oregon Public Service Commission:

"I call this company an especially well-managed company; its traffic expenses and maintenance expenses and expenses of operation are lower, due to close management, than all other companies. I don't know of any that I could put up for a standard of comparison with this company."

The Hall Building, Marshfield, Ore., Home of the Coos & Curry Telephone Co.

The Marshfield exchange is the largest exchange and has a Kellogg service switchboard with full features consisting of multiple line-lamp call-distribution, keyless listening, automatic peg count on answering cord, busy test, secret service, four-party harmonic machine ringing, revertive ringing tone, dark keyshelf, instantaneous disconnect and line lamp recall.

This switchboard was put into operation on November 22, 1924. North Bend has identically the same equipment and it was installed about a year prior.

This company was organized by Charles Hall in October, 1914, when he acquired the properties of the Coos Bay Home Telephone Co. Since that time there have been a number of smaller companies, as well as farmer companies, consolidated. The total assets at the time of purchase were $137,000. Today they are over $1,000,000 and increasing rapidly. This has been due in a large measure to the very exceptional natural advantage of the territory which the system covers.

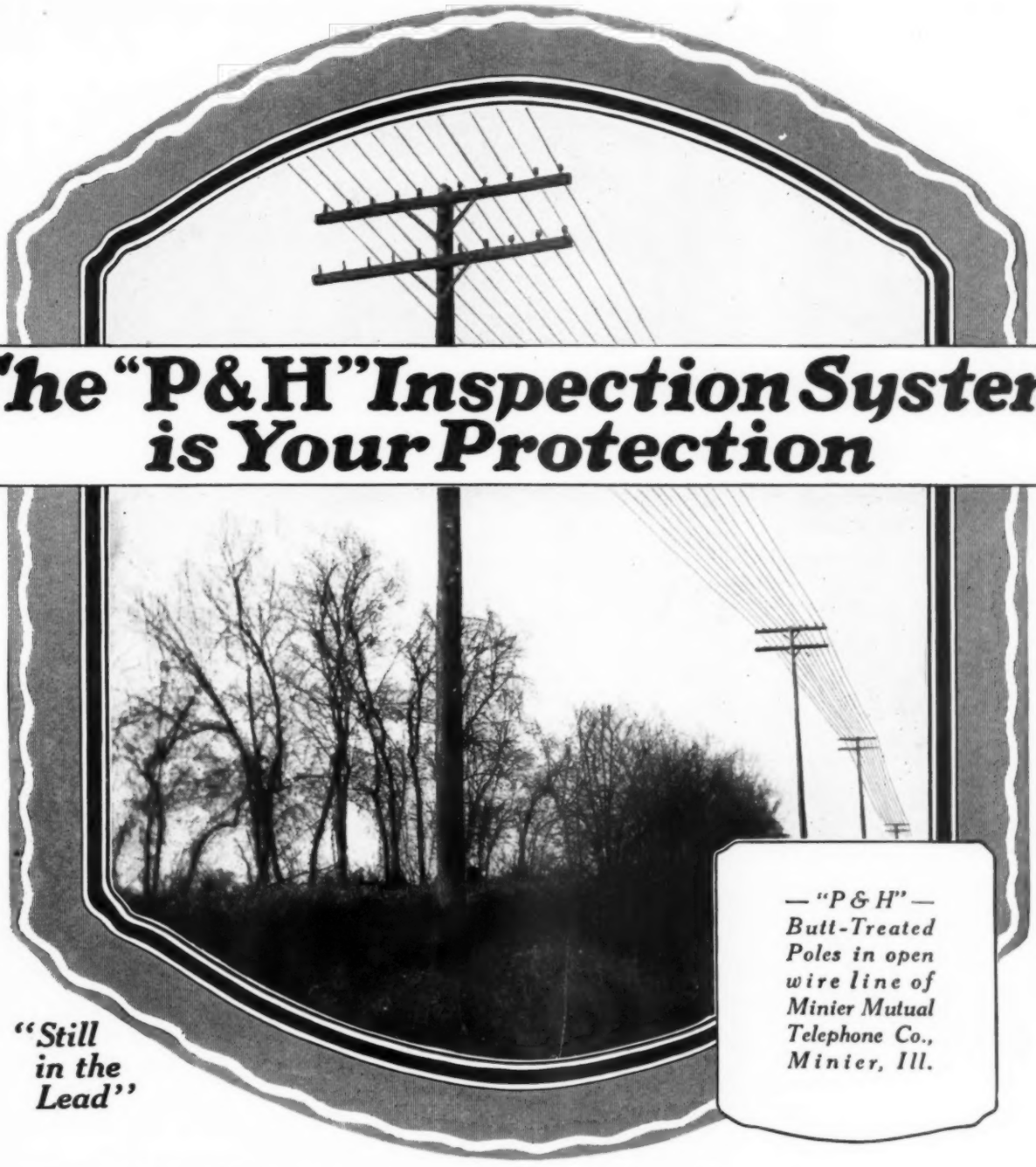
The Coos & Curry Telephone Co. now gives service in the following exchanges:

Oregon: Marshfield, Myrtle Point, Port Orford, Langlois, North Bend, Reedsport, Gold Beach, Coquille, Powers and Brookings.

California: Smith River and Crescent City. Twelve exchanges in two sates.

President Charles Hall of the Coos & Curry Telephone Co. in His Office.

Office of Earl W. Gates, Superintendent of Coos & Curry Telephone Co.



The "P&H" Inspection System is Your Protection

"Still in the Lead"

— "P & H" — Butt-Treated Poles in open wire line of Minier Mutual Telephone Co., Minier, Ill.

EVERY "P&H" pole must pass at least 7 inspections before it leaves our yard under the "P & H" brand. These inspections begin in the forests where the poles are cut, and the final inspection is made before the poles are shipped to you. Each inspection is made as carefully as though it were the first and last one.

Eighty-five points are checked in the inspection of "P & H Process" Poles. The creosote alone must pass seventeen tests. All this is done that pole users may have utmost in pole service.

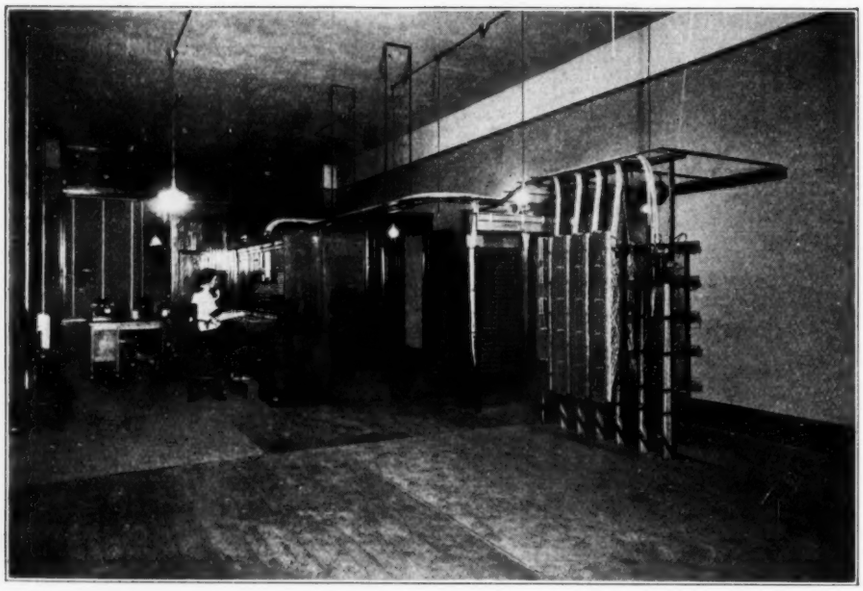
Prompt shipment on all your pole needs—Northern White or Western Red Cedar—Butt-Treated or untreated.

PAGE AND HILL CO.

MINNEAPOLIS, MINN.

New York, N. Y. 50 Church St.
Chicago, Ill. 19 So. LaSalle St.
Kansas City, Mo. 717 Bryant Bldg.
Omaha, Neb., 734 Electric Bldg.
Dayton, Ohio, 854 Reibold Bldg.
Dallas, Texas, 521 So. Akard St.

When writing to Page and Hill Co., please mention TELEPHONY.



View in the North Bend (Ore.) Exchange of Coos & Curry Telephone Co.

Earl W. Gates is general superintendent of the company and has been associated with Mr. Hall in the management since its organization.

The Coos & Curry Telephone Co. has always recognized the desirability of treating the public as though its interests were paramount and were to receive the first consideration at all times. It has consistently adhered to this policy with the result that it has established a feeling of good will and appreciation that is beyond price.

The patrons feel that it is fortunate to have an Independent telephone system in this section of Oregon, with officers who are in direct contact with, and a part of, the community, and that the company's standing is such as to make it possible to finance its necessary extensions and expand with the country's development.

This territory is due for an extensive growth. The undeveloped resources, as well as those which are partially developed, are larger probably than any other section in the United States. In Coos county there are 30 billion feet of standing timber: in western Douglas there are 40 billion feet; in Curry county there are 15 billion feet and in northern California 50 billion feet.

The fishing industry has been developed to an extent where they ship or can 5,500,000 pounds of salmon a year. In Coos county 250 square miles are underlined with coal. Due to the mild climate and fertile soil this section has wonderful possibilities for further dairy development. At the present time the dairy industry does a gross business of about $3,500,000 per year.

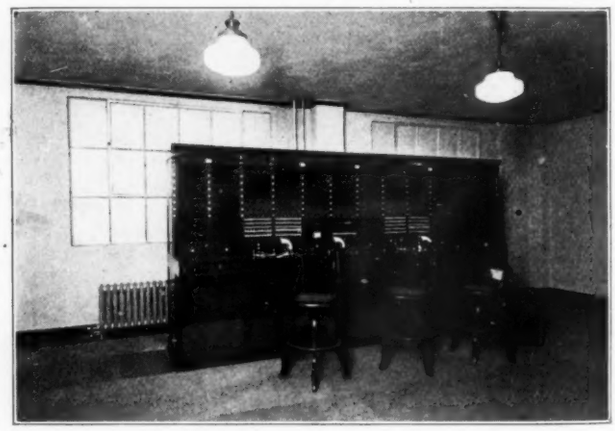
The Coos Bay harbor does considerable foreign shipping which is increasing rapidly, due to the jetties which have improved the entrance of the harbor. The government has appropriated more than $3,000,000 for this improvement, which was started about three years ago. Everything points to the continued prosperity and further development of the Coos & Curry Co. under policies and management that have proved successful.

New York City's Moving Day Expected to Set Record.

The fall moving-day period in New York City will cause a record number of changes in the location of residence and business telephone equipment according to a preliminary investigation by the New York Telephone Co.

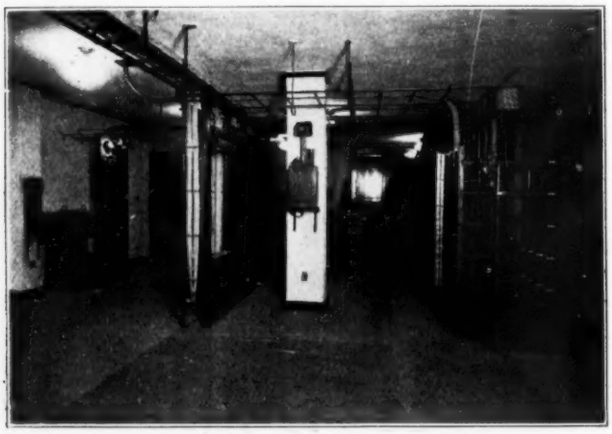
This survey was made in an effort to get as much advance information as possible concerning the moving plans of subscribers so that the relocation of equipment could be placed upon schedule and handled as promptly as possible.

The survey indicates that over 65,000 orders for the removal of telephone equipment from one location to another will be received during the moving period. This total exceeds by 9,000 the number handled during the moving period of last fall and the orders may be for the relocation of anything from a single telephone to large private branch exchange boards with hundreds of lines and telephones.



Toll Board of the Coos & Curry Telephone Co. at Marshfield.

In addition to the relocation orders, it is estimated that orders for the installation of approximately 21,000 new telephones during October will be received.



Terminal Room and Operators' Recreation Room in the Marshfield (Ore.) Exchange of the Coos & Curry Telephone Co.

Lyon Steel Lockers, Shelving, Cabinets and Steel Equipment for Telephone Companies
Lyon Metallic Manufacturing Company

LYON STEEL EQUIPMENT

The twenty-four pages of this bulletin are given to illustrations and descriptions of Lyon Steel Equipment for the telephone industry. Exchanges —large and small—warehouses, offices—all will find this bulletin—Number 314-A—interesting and helpful. Write today for a copy for yourself.

LYON STEEL PRODUCTS

LYON METALLIC MANUFACTURING CO., *Aurora, Illinois*

BOSTON	161 Devonshire Street	ROCHESTER	61 South Avenue	DETROIT	149-159 W. Fort Street
CLEVELAND	815 Superior Avenue, East	PHILADELPHIA	121 N. Broad Street	NEW YORK	342 Madison Avenue
PITTSBURGH	437 Smithfield Street	LOS ANGELES	337 S. Anderson Street	SAN FRANCISCO	906 Hobart Building
		CHICAGO	230 E. Ohio Street		

Authorized Representatives in Other Principal Cities

When writing to Lyon Metallic Mfg. Co., please mention TELEPHONY.

Here and There in Telephone Work

Telephone Company at Lincoln, Neb., Has Modern Warehouse.

For several years certain officials and older employes of the plant department of the Lincoln Telephone & Telegraph Co., Lincoln, Neb., had dreams of a model storeroom and warehouse. For years other more urgent matters crowded this subject aside, and the plant department got along as best it could with the congested quarters in the basement of the main building.

Recently a new warehouse has been completed and those who have waited long and worked with tireless energy are realizing their dreams for this new building is a model of comfort and efficiency.

M. T. Caster, plant superintendent, is largely responsible for this structure and the well-arranged plans; although he gives much credit to his assistants and other men in his and other departments for the development of various ideas which have been worked out to an advantage. He believes that time is well spent in paying attention to the welfare of employes. Many special features as well as the general plan of the building bear this out.

The walls of this building are of brick and the partitions of tile. It is, of course, fireproof in every respect. It cost approximately $60,000.

It covers a ground space of 100 ft. by 142 ft. and a second floor is over part of this space. The lower floor is occupied by a spacious garage, machine repair shop, car refinishing department and a general storeroom, including a shipping room. The instrument repair room, cable terminal repair room, locker room, refinishing department and miscellaneous repair department occupy the second floor. Not only are the departments arranged conveniently, but system and efficiency are evident everywhere.

Cars and trucks are cared for completely. They are inspected and made ready so that no delay is experienced by the men using them. A night service man attends to the ordinary requirements. Each car or truck is replenished with gas, oil and water; also loaded with whatever material is required by the workmen. "There is no excuse," says Mr. Caster, "for a working truck or car being in the garage after 7:30 a. m."

A complete machine repair department takes care of all repairs. It has proved more economical to do all car and truck repairing, besides more efficient than depending on an outside source. Systematic inspection of cars reduces costs of upkeep and prevents delays to men on the job.

Experts are in charge of the refinishing department also. After a thorough job of refinishing, cars are placed in dustproof drying rooms. All cars are washed immediately after their return from a trip through exposure to mud and rain.

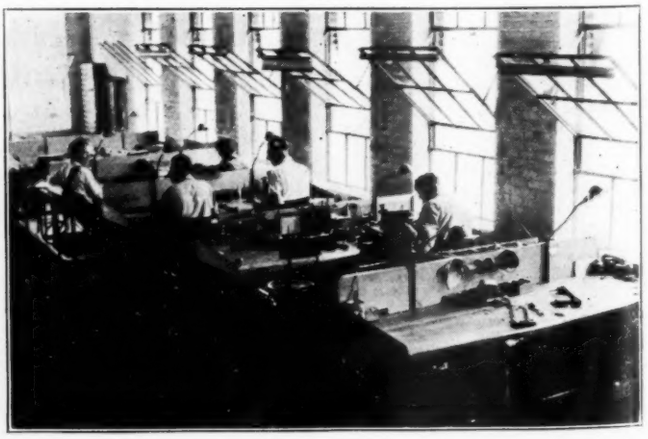
The main storeroom, in which all the heavier material is stored, is a model of neatness. All material is exactly classified and arranged so to provide the quickest possible service. No crowding or overlapping of supplies is apparent here.

In this department is one evidence of the thought and personal interest given by those in charge. When it came to figuring the cost of shelving and racks for material, the result was cause for study of some way to reduce the figure. One of the men suggested that the use of some salvaged angle irons from the old automatic equipment for racks would effect considerable saving. This proved successful.

Likewise a saving was made in the storeroom upstairs. Old telephone boxes were trimmed up and refinished for drawers. These are equipped with handles and name plates and present a very neat appearance.

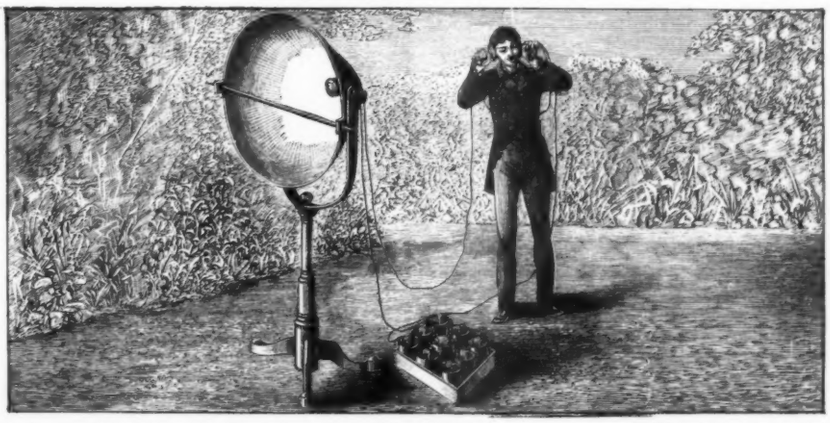
Easily operated "trucks" are in service for conveying material on the floor. These trucks are of a special type and were designed by men on the job. Trucks with portable trays are used to carry material

New Warehouse at Lincoln, Neb., of Lincoln Telephone & Telegraph Co.—Rear of Warehouse Showing Material Yard.



Shipping Room of the Lincoln Warehouse, Showing G. W. Donley and A. Gilmore—East Side of the General Shop Located in Warehouse.

Telephoning over a ray of light



Building on the Telephone Principle

FIFTY years ago Alexander Graham Bell discovered the principle of the telephone. His first telephone employed wire as the connecting path over which words passed. Four years later he used a beam of light instead of wire to carry speech between telephone instruments.

Today, both wire and wireless telephony are employed on every hand in the service of the nation. Wire telephony, with its thousands of central offices, its complex switchboards and millions of miles of wire, envelops the country, carrying for the American people 70,000,000 conversations every day. Wireless telephony is broadcasting entertainment and carrying important information to the remotest regions.

But new applications of the telephone principle are still being found. In the loud speaker, in the deaf set, the electrical stethoscope, the improved phonograph, the telephone principle has been adapted by the Bell Telephone Laboratories to the uses of the physician, the public speaker and the musician. The scientific research and engineering skill, which enable America to lead the world in telephone service, are also bringing forth from the telephone principle other devices of great usefulness.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

BELL SYSTEM

IN ITS SEMI-CENTENNIAL YEAR THE BELL SYSTEM LOOKS FORWARD TO CONTINUED PROGRESS IN TELEPHONE COMMUNICATION

and parts to and from the workbenches in the shop.

Wherever light is needed, ample is provided and controlled by awnings. Of course, ventilation is assured by the window space on all four sides. Heat is furnished by steam from a water tube boiler. The garage and shoproom upstairs are equipped with special overhead heating units, known as the Ventro-Finn type. These are placed near the ceiling and warm air is forced downward by means of motor power and air blast through the coils of the radiator. They are regulated by thermostatic control. The overhead arrangement makes available considerable floor space for other purposes.

The locker room, which is also used for general assemblies and as a class room, is very commodious. The washroom nearby is also well equipped. There are combination hot and cold water sprays for washing. This eliminates the unsanitary results from the ordinary faucets and lavatories. Other modern furnishings carry out the idea of comfort and sanitation.

As mentioned, the locker room is used by men who are taking special courses and training in telephone work. Some of these men are brought in from the districts and furnished, gratis, this training. The company also pays all expenses.

Service the Illinois Telephone Association Renders Members.

Secretary J. G. Mitchell of the Illinois Telephone Association in a recent circular letter addressed to the "Telephone Executive of any Telephone System in Illinois," says:

"There are many forms of service that the Illinois Telephone Association can render to its member companies in addition to the routine technical and legal office service that is frequently demanded. Some of the more obvious forms are:

1. Supply printed forms in small quantities at large quantity cost. Some that are kept in stock are:

(a) Placards announcing that the rates of the utility are on file for examination as required by the Illinois Commerce Commission.

(b) Application for employment blanks (solve many difficulties in the proper consideration of the qualifications of prospective employes).

(c) Standard toll rate cards.

(d) The Illinois Telephone Operator's Handbook (written especially for the small office operator).

2. Assist in the standardization of schedules and rules.

3. Locate causes of transmission losses (transmission engineering department).

4. Assist in working out traffic problems (traveling chief operator).

5. Confer, for the telephone industry, with other organizations on matters of general and not local character.

6. Assist in the equitable adjustment of controversies.

7. Consult files and supply copies of records and decisions.

In addition to these there are many other services that can be rendered, and many that are being rendered, upon specific requests.

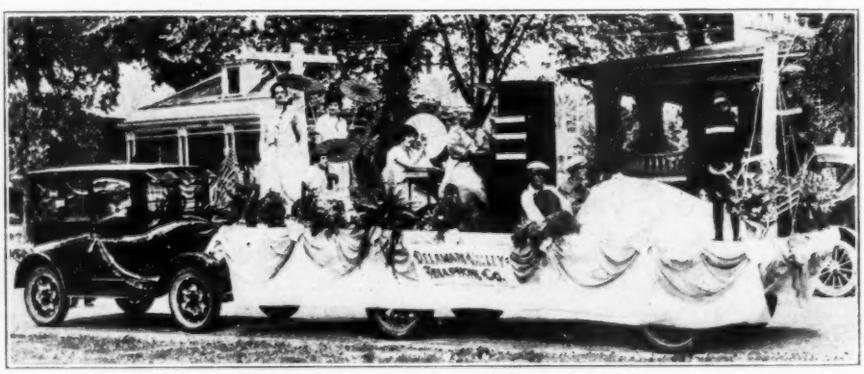
Is your company a member?

This is the day of cooperation. United effort more than ever before brings certain results."

Telephone Float in Fourth of July Parade a Prize-Winner.

Quite novel and teeming with interest was the float prepared by the Delaware Valley Telephone Co., of Valley Falls, Kans., for the local Fourth of July parade, the judges decided, and forthwith handed the company the first prize of $25.

Soft graceful lengths of blue and white bunting, luxuriant ferns and potted plants, transformed the company's construction motor truck into a miniature exchange plant with wires stretched overhead between poles at the ends of the float platform.



Prize-Winning Float of Delaware Valley Telephone Co. in Fourth of July Parade at Valley Falls, Kans.

Seated at a switchboard in the center of the float was Miss Katherin Williams, who has given 25 years of loyal service to the company as toll operator. To the front of the float stood a red-bedecked demon representing the telephone man's bug-bear—Trouble. Just beyond him was a lineman or troubleman who had secured Trouble with a chain.

Other employes occupied prominent positions on the float. Their summery frocks, together with the dainty Japanese parasols which they carried, added to attractiveness of the picture as indicated by the photograph reproduced on this page.

The Valley Falls exchange is lively and prosperous, according to the General Manager B. R. Hinchman. Says he: "We have an exchange of about 700 stations and are endeavoring to give our people the best service possible. We are in one of the best sections of good old Kansas, and Valley Falls is second to none for towns of its size."

Move Telephone Cables Linking Cuba with U. S.

Because of the work of dredging and improving the Havana harbor, it became necessary recently to change the location of the submarine cables in the port of Havana which furnish telephone service between Cuba and the United States.

The work of changing the location of these cables was arduous. The cables were raised and placed near the coast, towards the western part of the harbor. On raising them to the surface, they were placed on a scow. The first difficulty encountered was that of opening two of the cables which were found to be twisted together.

Another difficulty was the discovery of two anchors of five tons each which were resting on one of the cables in the bottom of the harbor. These had to be hoisted in order to extricate the cable, and this proved an operation which required extraordinary efforts because of the enormous weight involved.

The most difficult task of all, however, was that of passing the cable on the eastern side of the buoy at the Punta to the western side of it. It was necessary to lash the scow to the buoy on the east side and obtain a piece of cable long enough to form an arch. This was passed above the buoy. The time required for moving the three submarine cables from one side to the other was four days.

Rules for Radio Installations by Bureau of Standards.

In erecting antennas and guy wires for radio sets, see that you do not attach them to telegraph or electric light poles, do not carry your wires over streets or tracks, and avoid crossing electrical conductors of all kinds, warns the Bureau of Standards in its new Handbook No. 9, "Safety Rules for Radio Installations."

Antenna supports must be sufficiently rigid and of such sizes as to withstand any load which may come on them. Attachment to chimneys should be avoided. Metal poles or masts extending more than 10 feet above the supporting building must

"INSULATE"
(Registered Trademark)

Molded Composition
Also
"Bakelite"

Receiver Cases
Handles
Mouthpieces
Terminals, Etc.

Special articles
of all shapes
molded to order

100 Style { Knobs, Binding Posts, Headset Caps, Insulators, Etc.

in stock for prompt shipment.

GENERAL INSULATE CO.
1007 to 1015 Atlantic Ave.
BROOKLYN, N. Y.

Cope Specialties

The Cope Quick Coupling Conduit Rod is outstanding for its many salient features. It is designed for strength, durability and quick installation. It will **not** come uncoupled in the duct.

Cope Cable Racks likewise are made to stand severest test that can be given them. They are quickly installed.

Write for catalog today.

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Underground Electrical Equipment

Chicago Office
19 S. LaSalle St

2112-2114 Sansom St.
Philadelphia, Pa.

WESTON
accuracy-ruggedness in a Relay

Model 30

THIS device is in wide-spread use in telephone systems because engineers know they can depend upon Weston performance. ¶ This performance is important because Model 30 Relay is dependable for automatically opening and closing circuits. Its standard of precision and durability meet the exacting Weston laboratory tests and practical use in the field. ¶ Other Weston instruments for accurate electrical measurement are to be found in Central Offices everywhere. ¶ For complete information on Model 30 Relay or on any other instrument or electrical measurement problem in the Telephone Field, address—

WESTON ELECTRICAL INSTRUMENT CORPORATION
5 Weston Avenue, Newark, N. J.

STANDARD THE WORLD OVER
WESTON
Pioneers since 1888

be permanently and effectively grounded.

The bureau recommends that locations involving crossings over railroads, supply lines, etc., be avoided. When no other location is possible, special rules are given for the installation.

In the case of receiving stations, lead-in conductors shall be not less than No. 14 A. W. G. (0.064 inch) in diameter, if of copper, nor less than No. 17 A. W. G. (0.045 inch) if made of bronze or copper-covered steel. Clearances are given between lead-in wires and other conductors on the building, and it is recommended that lead-in conductors be "securely fastened in a workmanlike manner." The code also requires that the lead-in wire shall enter the building "through a rigid non-combustible, nonabsorptive, insulating tube or bushing, or through a drilled window pane."

For receiving stations, grounds must not be made to gas pipes, but should be made to cold water pipes, if these are connected to a street main. An outlet pipe from a water tank fed by a street main or a well may be used, provided such outlet pipe is adequately bonded to the inlet pipe connected to a street main or well. Where the wire is attached, suitable clamps must be used, and the entire surface of the pipe covered by the clamp must be scraped clean.

Rules for the application of protective devices, such as lightning arresters, and antenna grounding switch are also given. Each lead-in conductor for a receiving station must be provided with a lightning arrester, whether or not an antenna grounding switch is used. The arrester may be either outside the building or inside, if away from the combustible materials.

If the radio set is connected to a power supply line, the device used and methods of wiring must be in accordance with the rules covering permanent or portable fixtures, devices and appliances, as given in section 37 of the National Electrical Safety Co.. The wiring of storage batteries must also conform to these rules, and such batteries must be placed where there is adequate ventilation.

Copies of Handbook No. 9 may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

Exchange Properties at Spiceland, Ind., Changes Hands.

The Spiceland Cooperative Telephone Co., Spiceland, Ind., owned for the past 12 years by A. R. Martmer, has been sold to Lloyd Christley, formerly manager of the telephone exchange at Williamsport. The consideration was not made public.

The plant is serving approximately 520 persons in two counties, Henry and Rush, covering 120 miles of territory. Two exchanges are maintained, these being located at Spiceland and Mays Station. Four towns are served by the telephone company, including Mays, Spiceland, Sexton and Dunreith.

Six operators are employed in the two exchanges and in addition to the local service maintained, the company has toll connection with the larger cities, where other connections given the subscribers of the company egress to the entire world.

Mr. Christley, the purchaser of the plant, has operated plants in Francisville, Monon, Bosewell, West Lebanon and Williamsport, having been located at the latter place for the past five years. He took charge of the plants September 11 and plans to make several improvements at the outset of his ownership.

Subscriber Growth in California, Oregon and Washington.

The number of telephone stations in Portland, Ore, increased in the first six months of this year from 84,461 to 86,757, a gain of 2,316, or 2.74 per cent, according to report issued by Pacific Telephone & Telegraph Co.

The number of telephone stations in Seattle, Wash., was reported at the end of June as 99,333, which established a gain for the preceding six months of 2.41 per cent. Stations in San Francisco, Calif., mounted to 222,026 for a gain of 3.04 per cent, and in Los Angeles to 291,518, for a gain of 3.83 per cent.

In Oregon cities outside of Portland, the June 30 number of stations and percentage of increase in the half-year were: Astoria, 2.43 per cent to 2,903; Bend, 3.83 per cent to 1,517; Eugene, 0.59 per cent to 4,964; Grants Pass, 6.26 per cent to 1,018; Klamath Falls, 6.68 per cent to 2,091; Salem, 1.54 per cent to 5,471; St. Helens, 6.92 per cent to 541; The Dalles, 0.68 per cent to 1,786.

The Longview-Kelso telephone exchange located in Washington reported a gain of stations in the six months of 8.32 per cent to a total of 2,070.

What the Commissions Are Doing

Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

New York Joins Boston in Fight on Bell.

Following a conference on the part of Corporation Counsel Frank S. Deland and E. Mark Sullivan of Boston, Mass., with Assistant Corporation Counsel S. Fertig of New York City, it is announced that New York will join Boston in the two complaints which have been filed before the Interstate Commerce Commission against the American Telephone & Telegraph Co.

The New York attorney will call a conference of counsel representing cities throughout the country that have expressed an intention of intervening in the Boston complaints. The suggestion comes from the officials of Grand Rapids, Mich.

Attorney Sullivan explains that one of the complaints is brought under the interstate commerce law and is directed against rates charged by the New England Telephone & Telegraph Co. and the American company. This is an amendment to the one originally brought by Mayor Curley.

The other, said Sullivan, is an original one brought by Mayor Nichols under the Clayton anti-trust law, and is against a so-called monopoly exercised by the Bell system over telephone operations, the manufacture and distribution and use of telephone equipment, both patented and unpatented, and over the issuing and sale of telephone securities.

Lower local telephone rates are the objective of the fight, it being conceded that long distance rates are low enough now.

Minatare, Neb., Changed from Magneto to Common Battery.

The Platte Valley Telephone Co. has just completed the cut-over of its exchange at Minatare from the magneto type to the common battery, the fifth town in the valley to be reconstructed in this manner. The others are Torrington, Mitchell and Gering on these lines and Oshkosh on the Wehn company, owned by the same group.

The Minatare exchange has 300 lines not including the farm and toll lines. The newest type of instruments are used. Otto Fuerst, plant superintendent, was in charge of the work, and the cut-over was complete and satisfactory. The new rates allowed by the commission will become effective October 1.

Refuses Permission to Cancel Toll Terminal Rates.

The Nebraska State Railway Commission has denied the request of the Northwestern Bell Telephone Co. for permission to cancel its toll terminal rates out of its schedule. It held that so long as anyone desired this service, after it had once been offered, he was entitled to receive it.

Only one man, a patron on the Grand Island exchange, blocked the order, and as he was willing to pay $4 a month instead of the old rate of $3 a month, it was so ordered.

Both the Bell and the Lincoln company are rapidly removing all strictly toll stations in business houses. The development of the C-R-L system of direct calling, where a direct circuit is available, and other mechanical devices have made this service unnecessary because it is slower than the new way. As the companies find profit in speeding up toll business and service, they are anxious to get rid of the strictly toll telephone wherever they can do it.

Kansas City Files Brief Opposing Bell Ownership.

City Counselor John T. Barker, of Kansas City, filed a brief September 7 with the Missouri Public Service Commission, opposing an application for a permit to transfer property of the Kansas City Telephone Co. to the Southwestern Bell Telephone Co.

The city counselor asserted that the public service commission, both by law and contract, is without authority to grant the application for the transfer. He said the city opposes the transfer because "it feels it is against public interest and in direct violation of the franchise agreement entered into with Kansas City by these two telephone companies."

A transfer would be followed by an application for an increase in rates Mr. Barker charged.

The city's brief cited numerous cases upholding its contention that the commission has no right to grant the transfer of the property over the objection of the city.

Changes Authorized in Nebraska Toll Changes.

The Nebraska State Railway Commission has granted the applications recently filed by the Northwestern Bell Telephone Co. and the Lincoln Telephone & Telegraph Co. for approval of certain reductions in their charges for toll service, as well as to amend certain tariff provisions that will be advantageous to patrons. The new tariffs become effective on October 1, and will govern the charges to be made by all companies.

The principal changes are: The new tariff permits reverse charges on station-to-station calls, except between points where person-to-person service is not offered. The present tariff does not permit of this. Report charges are made where, in connection with a request for reversal of charges the acceptance of the charges is refused at the called station and the calling party is unwilling to pay the charges for completing the call.

The rates for station-to-station messages

Spend 20% and Save 80%

THE BABY DIGGER will enable you to save 80% of hand labor costs on your Telephone Conduit Trenching. Such an economy certainly makes the Baby Digger worthy of your investigation.

Light - Sturdy - Powerful

Let us send you complete information

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Pioneers of the Small Trencher

20100 St. Clair Avenue Cleveland, Ohio, U. S. A.

THE BABY DIGGER

REGISTERED

Do you always mention TELEPHONY?—Thank you.

in the new tariff are identical with the present toll tariff on messages measured not in excess of 128 air-line miles. For distances in excess of 128 air-line miles, the scale has been reduced as follows:

Present rates—

Air line miles. Over	Up to and including	Station-to-Station Initial Day Rate.
118.....	128	$0.85
128.....	136	.90
136.....	144	.95
144.....	152	1.00
etc. by 8-mile steps.		and thereafter increasing in 5-cent steps.

New rates—

Air line miles. Over	Up to and including	Station-to-Station Initial Day Rate.
118.....	128	$0.85
128.....	138	.90
138.....	150	.95
150.....	162	1.00
etc. by 12-mile steps.		and thereafter increasing in 5-cent steps.

An amendment is also made to rates for station-to-station night messages. At present the initial night rates for station-to-station calls on which connection is established between 8:30 p. m. and 4:30 a. m. are approximately 50 per cent less than the initial day rates, except that no reduction is made where the initial station-to-station day rate is 35 cents or less and except that the minimum discounted rate is 35 cents.

The new tariff provides for an evening rate for station-to-station toll messages on which communication is established after 7 p. m. and before 8:30 p. m. of approximately 25 per cent less than the initial day rates, except that no reduction is made where the initial rate or the discounted rate is 35 cents or less. It also provides that for calls between the old hours of 8:30 p. m. and 4:30 a. m. the rates shall be approximately 50 per cent less with the exceptions the same as now as to minimum charges.

No change is contemplated in person-to-person charges. The commission says that the rates proposed have been checked with the tariffs heretofore approved and filed with the commission, and the statements found in the applications are true. The proposed toll tariff, will, as alleged by applicants, result in a saving to their patrons. The application is found reasonable and approved. The schedule applies only on intrastate messages, but the Northwestern Bell company advises the commission that on October 1 similar reductions and amendments to tariffs will be made on interstate messages on the entire system.

Approves Change in Practice but Not Rate Increase.

The Curtis & Fox Creek Telephone Co. has been denied the 25-cent increase in rates from $1.25 to $1.50 net, asked of the Nebraska State Railway Commission. The company has no switchboard and pays the Curtis company 45 cents a month for switching its subscribers. In the past the company has allowed the patrons to furnish telephones. It now proposes to do this itself, and asked for the rate increase on the ground that the present schedule puts it $135.27 a year in the hole.

The commission approves of the change of practice as one calculated to insure better service, but diagnosing the financial statement it is of the opinion that a rate of $1.35 will give the company a net applicable to dividends of $401 a year, and so orders that in effect, although the increase is no more than the cost of batteries. The company's property was not valued, but is returned at close to $4,000.

Farm Line Service Poor; Commission Aid Asked.

The Nebraska State Railway Commission has been asked by the Community Club of Callaway to send a telephone engineer to that city to investigate service conditions over farm lines, to determine the responsibility for the wretched conditions that exist, and to insist upon them being remedied. The secretary writes that the farm line officials say that the fault is on the board of the Callaway company that switches them, and the company says it is because the lines are in poor shape.

H. H. Andrews has also written the commission asking for authority to cut off service to the Callaway & Redfern company, one of the farm mutuals, unless it will place its lines in repair. He says he has offered to supply a lineman to put the lines of this and other farm companies in service condition, but he has been unable to interest any of them.

Summary of Commission Rulings and Schedule of Hearings.

CALIFORNIA.

September 15: O. F. Goodrich, doing business under the name of Antelope Valley Telephone Co., which serves subscribers in the town of Lancaster, Los Angeles county, has applied for permission to establish a charge of five cents for each message made from public pay stations.

September 15: The Guglielmetti Telephone Co. of Petaluma, having applied for a revision and an increase of its rates, has been directed by the commission to acquire ownership of all the facilities and service, and the maintenance thereof, as a condition for authorization of a revised rate schedule calculated to produce the necessary revenue for an adequate service.

ILLINOIS.

August 13: Order issued approving intercorporate agreement, dated February 1, 1926, between the Illinois Bell Telephone Co. and the Morrison Brothers Telephone Co.

August 13: Order issued approving supplemental agreement dated June 10, 1926, between the Illinois Bell Telephone Co. and the American Telephone & Telegraph Co., modifying agreement dated March 1, 1925, by altering the numbers of certain circuits covered by the facility lease.

August 13: Order issued suspending until November 23, 1926, proposed rates for telephone service in Bloomington and Normal, stated in rate schedule Ill. C. C. 2, of the Kinloch-Bloomington Telephone Co. of Bloomington.

August 13: Order issued suspending until November 23, 1926, proposed rates for telephone service in DePue and vicinity, stated in rate schedule Ill. C. C. No. 3 of the DePue Telephone Co. of DePue.

August 13: Order issued authorizing the Milford Telephone Exchange Co. to purchase, and the Milford Telephone Co. of Milford to sell its entire property in the villages of Milford and Stockland, and vicinity, Iroquois county, for $40,000; granting to the purchasing company a certificate of convenience and necessity to construct, operate and maintain a telephone plant or system and to transact a telephone business in the territory stated above; and authorizing the purchasing company to issue and sell $25,000 aggregate par amount of its 7 per cent cumulative preferred stock, consisting of 250 shares of par value of $100 per share, and 150 shares of its common capital stock without par value.

August 13: Order issued approving intercorporate agreement dated March 10, 1926, between the Illinois Bell Telephone Co. and the Woodbine Telephone Co. of Woodbine now the Woodbine Mutual Telephone Exchange.

August 13: Order issued approving intercorporate agreement dated July 31, 1926, between the Illinois Bell Telephone Co. and the Citizens Telephone Co. of Pekin.

August 13: Order issued approving intercorporate agreement dated February 10, 1926, between the Illinois Bell Telephone Co. and the Bunker Hill Telephone Co. of Bunker Hill.

August 13: Order issued approving intercorporate agreement dated June 28, 1926, between the Illinois Bell Telephone Co. and the Vermillion County Telephone Co. of Danville.

August 13: Order issued approving intercorporate agreement dated July 8, 1926, between the Illinois Bell Telephone Co. and the Intra-State Telephone Co.

August 13: Order issued approving intercorporate agreement dated February 27, 1926, between the Illinois Bell Telephone Co. and the Fosterburg Mutual Telephone Co.

August 13: Order issued approving intercorporate agreement dated March 1, 1926, between the Illinois Bell Telephone Co. and the National Telephone & Electric Co.

August 13: Order issued approving intercorporate agreement dated March 1, 1926, between the Illinois Bell Telephone Co. and the Northwestern Illinois Utilities Co.

August 13: Order issued approving intercorporate agreement dated April 26, 1926, between the Illinois Bell Telephone Co. and the State Center Telephone Co. of Maroa.

September 21: Hearing at Springfield, before Commissioner Lindly, in the matter of complaint filed by L. O. Addleman, charging the Little York Telephone Exchange of Little York with rendering poor and unsatisfactory telephone service at Little York.

September 21: Hearing at Springfield, before Commissioner Wright, on application of the Wabash Valley Telephone Co., of Paris, for advance in rates, as stated in rate schedule Ill. C. C. No. 2 of the

company covering service in Paris, Chrisman, Marshall, Horace, Metcalf, West Union, Elbridge, Redmon, Vermilion, Hume, Sidell, Ridgefarm, Grandview, Oliver, Brocton, Sandford, Libertyville, Clarksville, Clarks, Martinville and Hutsonville. Protests filed by patrons of petitioner, Harry B. Potter and other, Marshall, R. R. No. 2, Roy C. Hammond and others, patrons of Clarkville Switchboard Co., patrons of Elbridge Telephone Exchange.

September 21: Hearing at Springfield before Chairman F. L. Smith in the matter of application of the Little York Telephone Exchange, for a certificate of convenience and necessity to operate a telephone exchange in the city of Little York, Warren county.

September 21: Hearing at Springfield before Chairman F. L. Smith on application of the Little York Telephone Exchange for an order authorizing the issue of capital stock in the amount of $10,000.

September 22: Hearing at Springfield before Commissioner Lindey on application of the Illinois Bell Telephone Co. for authority to increase its rates for service in Quincy and vicinity, stated in the rate schedule filed by the company.

September 22: Hearing at Springfield before Commissioner Lindly on application of the Camp Point Telephone Co., county of Adams, for authority to increase its rates in Camp Point, as stated in rate schedule Ill. C. C. No. 2, of the company.

September 23: Hearing at Springfield before Commissioner Burkhardt on application of the Illinois Bell Telephone Co. for authority to increase its rates in Champaign and Urbana, as stated in the rate schedules filed by the company. A joint petition was filed by the city of Urbana, city of Champaign, Chamber of Commerce of city of Champaign, The Association of Commerce of city of Urbana, for rehearing and suspension of effective date of order entered June 25, 1925. A resolution of the board of supervisors of Champaign county against increased rates for telephone service in Champaign, also filed.

NEBRASKA.

September 13: In the matter of the application of the Northwestern Bell Telephone Co. for increase from $3 to $4 for toll terminals; found reasonable and authority granted.

September 14: In the matter of the application of the Curtis & Fox Creek Telephone Co. for authority to increase rates from $1.25 to $1.50 a month; found an increase of 10 cents justified by the testimony, and authority given to charge $1.35 a month net for the future.

September 14: Complaint filed by Kearney Union Valley Telephone Co. against Kearney Telephone Co., alleging failure to divide tolls on switched lines.

September 14: In the matter of the application of the Lodge Pole Telephone Co. for authority to charge $1.75 a month for metallic service on farm line, this being made necessary by interference from paralleling transmission line; found reasonable and authorized.

September 15: Complaint filed by A. W. Koch, of Odell, against Odell Telephone Co., alleging overcharge on extension set.

September 15: Application filed by Platte Valley Telephone Co. for authority to adopt tariffs on intrastate tolls as authorized by commission for Northwestern Bell and Lincoln telephone companies.

September 15: Application filed by Wehn Telephone Co. for authority to adopt tariffs on intrastate tolls as authorized by commission for Northwestern Bell and Lincoln telephone companies.

September 29: Hearing at Petersburg on application of Petersburg Telephone Co. for authority to cancel free service between Petersburg and Elgin and substitute toll rate therefor.

NEW YORK.

September 20: Hearing at Rochester on petition of the Rochester Telephone Corp. for authority to merge the Boswell Corners Telephone Co. of Ontario county.

September 20: Hearing at Rochester, on petition of the Rochester Telephone Corp. for authority to merge the Guilick Independent Telephone Co. of Ontario county.

PENNSYLVANIA.

September 30: Hearing at Erie on application of the Mutual Telephone Co. for placing in effect on the Erie exchange an increased schedule of rates.

New York District Meeting at Stamford in the Catskills.

A district meeting and traffic conference of the Up-State Telephone Association of New York will be held at Westholm hotel, Stamford, Delaware county on Wednesday, September 29.

Stamford is one of the most attractive resorts in the Catskill mountains and can easily be reached by all telephone people from Albany, Rensselaer, Columbia, Dutchess, Ulster, Delaware, Otsego, Chenango and Green counties.

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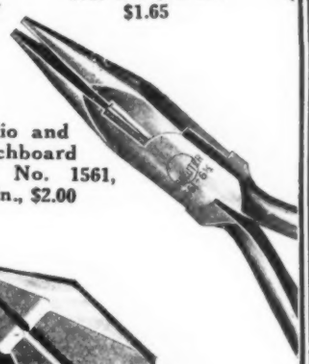
Diagonal Cutting Pliers. No. 2601, 6 in. $1.65



Radio and Switchboard Pliers. No. 1561, 6½ in., $2.00

Kraeuter Lineman's Pliers, No. 2801, 8½ in., $2.75

EVERY pair of Kraeuter Pliers is hardened with extreme accuracy.

Their cutters are *hard* but not brittle.

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Every pair is tested at the factory for *strength, toughness* and *cutting power.*

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Small Trencher Machine for Digging in Narrow Places.

The "Baby Digger" manufactured by the Cleveland Trencher Co. of Cleveland, Ohio, is being successfully used in digging trenches for telephone conduit. It is extremely light, weighing less than four tons, which allows it to be moved without damage to sidewalks or pavements. It is readily moved on a trailer or truck from job to job. It is but 4 feet, 9 inches wide, and can be used on lawns and sidewalks close to trees and poles.

The Cleveland Trencher Co. is a pioneer in the manufacture of small trenchers, having designed and constructed the Baby Digger to meet the demand for a trenching machine that could work in alleys and narrow places, where formerly only hand digging was possible.

The Baby Digger has variable cutting widths and digging speeds; it will dig to a depth of 5½ feet, and has six trench-cutting speeds. These specifications make it an ideal trencher for telephone conduit work.

Diagram Showing Practices in Joint Pole Construction.

In recent issues of the Hubbard Linebuilder, the monthly publication of the electrical materials department of Hubbard & Co., of Pittsburgh, Pa., appear diagrams of joint pole construction. These diagrams conform to the general specifications for the construction of jointly-used wood pole lines carrying supply circuits and signal circuits.

One diagram shows the arrangements of attachments and clearances; another an incandescent lamp on a jointly-used pole showing the use of a duplex conductor on insulated brackets for vertical runs. A third diagram gives the relative position of attachments of the different classes, showing vertical clearances and climbing space. Still another gives the relative position of crossarms.

The diagrams are of large size and clearly and distinctly lettered, indicating sizes and kinds of crossarms, hardware, spacings, etc.

Copies of these diagrams may be obtained by interested telephone men, upon application to R. G. Robbins, editor of the Hubbard Linebuilder, Hubbard & Co., 6301 Butler street, Pittsburgh, Pa.

Half a Stroke Wins Cup in English Golf Match.

A mixed foursome competition arranged by the golf club of the Automatic Telephone Mfg. Co., Liverpool, England, at the Bowring municipal course resulted in Mrs. Passmore and J. Williams returning with a net score of 76½ (combined handicap 31½), winning a handsome silver trophy for the lady.

Mrs. Holland and R. E. Boyd were runners up with a net score of 77 (combined handicap 26). There were 11 foursomes in all and other scores followed very closely, keen competition being thoroughly displayed.

Group of Golfers Participating in the Mixed Foursome Competition of the Automatic Telephone Mfg. Co., Liverpool, England.

New Catalog of Fire Pots and Blow Torches.

The Turner Brass Works, Sycamore, Ill., has recently revised its catalog No. 1, which gives lower list prices, on its torches and fire pots.

The catalog illustrates and describes the different fire pots and blow torches and gives recommendations for their various uses based upon experience and observation under the most exacting conditions. The No. 66 telephone fire pot is made especially for telephone, electrical construction, and cable work, and can be used for melting lead, tin, zinc, rosin, paraffin, or insulating material. This fire pot functions on either gasoline or kerosene without changing the jet.

Blow torches in quart and pint sizes for many different purposes are illustrated and described. Lists of repair parts for fire pots and also for blow torches are also included in the catalog, copies which may be obtained upon application to the Turner Brass Works, Sycamore, Ill.

Bulletin Catalog Issued by Jas. R. Kearney Corp.

The Jas. R. Kearney Corp., manufacturer of overhead and underground utility equipment, 4224-32 Clayton avenue, St. Louis, Mo., has recently issued a bulletin catalog. The corporation is a new organization and this is its first catalog.

Bulletins contained in the catalog are on anchors, plug cutouts, service connectors for light and power service taps, guy wire clips, dead-end eyes, and extension sleeve twisters. Additional bulletins on other specialties will be available shortly. A complete catalog, or single bulletins as specified, may be obtained upon request.

Massachusetts Commission to Review New England Rates.

The Massachusetts Department of Public Utilities will conduct an inquiry into the business of the New England Telephone & Telegraph Co. to determine what changes in telephone rates, if any, may be needed.

The inquiry will be made in connection with a check-up of the figures sub-

THEODORE GARY AND COMPANY
KANSAS CITY, MISSOURI

Seventy-third Consecutive Quarterly Dividend

The regular quarterly dividend of $3.00 a share on the Common Stock; $2.00 a share on the Preferred Stock, has this day been declared payable October 1, 1926 to the Stockholders of record as of the 30th day of September, 1926, at 3:00 P. M. The books will be closed to transfer on September 25th and reopened on October 1, 1926.

(Signed) H. L. GARY,
First Vice-President and Treasurer.

September 13, 1926.

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"REBUILT" when connected with PREMIER means something.

POSITIONS WANTED

POSITION WANTED—By steady, experienced telephone man. Can assume full responsibility if desired. Steady work wanted. Address 6680, care of TELEPHONY.

WANTED POSITION—With telephone company by married man. Sixteen years' experience. All around telephone man. References. Address 6688, care of TELEPHONY.

POSITION WANTED—By married man. Can assume full responsibility. Nine years' experience in trouble and reconstruction work. Reliable references. Address Ashley Telephone Co., Ashley, Ill.

WANTED—Position by all around telephone man. Nine years' experience. Can do own cable work. Address 6691, care of TELEPHONY.

WANTED TO BUY

WANTED—A telephone plant, 450 to 600 stations, or control in larger plant in Ohio, Indiana, Michigan or Pennsylvania. State terms. Address 6689, care of TELEPHONY.

WANTED—By practical telephone man, to buy interest in well located telephone plant of 1,000 to 1,500 stations, one office. Address 6693, care of TELEPHONY.

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Rebuilt Magneto Telephone Equipment

A limited number of the following rebuilt equipment in very fine condition.

Stromberg - Carlson, ball swivel, local battery desk stands only, complete with receiver, transmitter and new cord.....$4.00

Dean desk stands only, local battery, non-breakable, with induction coil, complete with receiver, Dean or Kellogg transmitter and new cord..... 4.00

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Dean desk sets, 3 or 4 bar gen., 1000 or 1600 ohm ringers 6.50

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Guaranteed Telephone Equipment

Leich Elec. Co. pulsating harmonic ringers, 30-42-54 cycles, each	$ 1.00
Leich harmonic ringers, 16-33-50-66 cycles, each	1.00
Leich No. 21 double cut-off jacks (not worn), 10 per strip (per strip)	2.00
Leich 2-A ringing, listening and ring-back keys, each	1.50
Leich 1-C common battery transmitters, each	.75
Leich 1-A permanent magnet receivers, each	.75
Same with new cords, each	1.00
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Same with new cords, each	1.00
Leich straight line wooden extension bell boxes, each	1.50
Leich harmonic wooden extension bell boxes, each	2.00
Leich automaphone wall sets, type 6-A, each	7.50
Leich 105-A 5-bar compact magneto wall telephones (refinished), each	10.00

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FOR SALE

FOR SALE—If you want to purchase or sell a telephone property, write H. B Crandell, P. O. Box 226, Springfield, Ill

Stromberg 1000 ohm ringers.....$ .75
Dean 1000 ohm ringers..... .75
Wood bell boxes, 80, 100, 500, 1000 ohm ringers 1.00

Reliable Telephone & Supply Co.
Chas. Domke, Mgr.
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FOR SALE—Telephone Exchange, 180 telephones in town, switch 375 farmers phones. Residence rates, $1.25 and $1.50. Business, $2.00 and $2.25 per month. Switching farmers, rates $5.00 per year. Gross annual revenue more than $4,000. Exchange in fine condition, mostly Western Electric; main part cabled; sublicense with Bell and no competition. Level country. Apply H. W. Couch, owner, Center, Mo.

FOR SALE—Telephone Exchange in Kansas, over 400 stations. Cash price, $14,500.00 including 5-room residence near office. Address 6694, care of TELEPHONY.

PUBLIC SALE of Telephone Plant at Osmond, Nebraska, October 11, 1926. 295 Stations, underground system, in No. 1 shape. Write Dr. C. E. Rodgers, Osmond, Nebr., for particulars.

HELP WANTED

WANTED—A Telephone Repairman, experienced on local and common battery equipment. Inside shop work only, with one of the larger independent, operating companies of central Indiana. United Telephone Company, No. 26 Stokes Bldg., Indianapolis, Ind.

WANTED—Good magneto combination man who can take charge of 350 to 400 telephones. Give references and experience. North Creek Telephone Co., North Creek, N. Y.

WANTED—Married man for small exchange to do general telephone work. Prefer one whose wife can operate. First class references required. Address 6685, care of TELEPHONY.

WANTED—Steady, experienced telephone man. Give references in first letter. Address 6686, care of TELEPHONY.

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Exclusive Telephone Accountants

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Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization, and Operation of Telephone Companies.
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Cyrus G. Hill
1217 First National Bank Bldg., Chicago

mitted by the New England Telephone & Telegraph Co., of its financial condition during the 12 months since the 20 per cent increase in rates was granted August 1, 1925.

In commenting on the proposed inquiry Henry C. Attwill, chairman of the commission, stated that he will have an investigation made to see if differences between the company and its patrons in particular instances may not be adjusted.

There are no figures available at the commission's office by which the business done by the company for the year ending July 31, 1926, may be compared with that of the 12 months ending July 31, 1925.

The proposed inquiry and check-up is the result of stipulations provided in the order issued by the commission on July 30, 1925, at the time the rate increase was granted.

The commission expressed the belief that it would be wise "not to finally dispose of the case, but to allow the rates to become effective when modified with the understanding that they will be subject to changes that a year's experience may demonstrate are desirable or necessary."

Public Utilities Aid Recognized in New Jersey Disaster.

Assistant Secretary of War Davison has written letters commending the New York Telephone Co. and the New Jersey Power & Light Co. for efficient service after the recent explosion at Lake Denmark.

The telephone company was thanked for installing three trunk lines in the temporary headquarters at Picatinny Arsenal within four hours after the explosion and the power and light company for rushing two searchlight trucks to the scene of the disaster and installing a temporary light and power line the following morning.

Telephone Installed Mile Deep in Copper Mine Shaft.

What is probably the world's deepest telephone was recently installed at the bottom of a shaft over one mile in depth. The shaft is the property of the Calumet & Hecla Consolidated copper mines, and the telephone, one of many others in the mine system, is used by a pump man at the bottom of the shaft to report water levels to the engineers at the surface.

The connecting cable, which runs down the vertical shaft, is 5,300 feet long and weighs four tons. It is anchored to shaft timbers at regular intervals with special clamps that support the weight and prevent the line from sagging.

Prices in the Metal Markets.

New York, Sept. 20—Copper—Dull, electrolytic, spot and futures, 14⅜c. Tin—Easy. Spot and nearby, $70; futures, $67.25. Iron—Steady; No. 1 northern, $20.50@21.50; No. 2 northern, $19@20.50; No. 2 southern, $21@22.

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